

Program Structure

Program: B.Sc. Honours (Food Science and Technology)

Program Code: SBR0411

Batch: 2018-21

Department of Life Sciences

School of Basic Sciences and Research

1. TITLE: Bachelor of Science (Hons.) in Food Science and Technology

2. DURATION OF THE COURSE: 3 YEARS

3. YEAR OF IMPLIMENTATION

This syllabus will be implemented for the session 2019-2022onwards.

4. PREAMBLE

Total Credits- 143

Total Number of Semesters – 6 (Two semesters per year)

Total Number of Theory Papers – 31

Total Number of Practical courses – 12

Total Number of Minor Projects/Dissertations- 02

Number of papers (theory) per semester – 05/06

Number of Laboratory courses per semester – 03/02

1. Standard Structure of the Program at University Level

1.1 Vision, Mission and Core Values of the University

Vision of the University

To serve the society by being a global University of higher learning in pursuit of academic excellence, innovation and nurturing entrepreneurship.

Mission of the University

- 1. Transformative educational experience**
- 2. Enrichment by educational initiatives that encourage global outlook**
- 3. Develop research, support disruptive innovations and accelerate entrepreneurship**
- 4. Seeking beyond boundaries**

Core Values

- Integrity**
- Leadership**
- Diversity**
- Community**

1.2 Vision and Mission of the School

Vision of the School

Achieving Excellence in the Realm of Basic and Applied Sciences to Address the Global Challenges of Evolving Society

Mission of the School

- 1. To equip the students with knowledge and skills in basic and applied sciences.**
- 2. Capacity building through advanced training and academic flexibility.**
- 3. To establish centre of excellence for ecologically and socially innovative research.**
- 4. To strengthen inter institutional and industrial collaboration for skill development and global employability.**

Core Values

- 1. Passion**
- 2. Perseverance**
- 3. Scientific nature**
- 4. Yearning for truth**

1.2 Vision and Mission of the Department

Vision of the Department

To acquire and impart knowledge of Food Science and Technology so as to build capacity for addressing current global challenges

Mission of the Department

- 1. To train and transform students into technical researchers/ professionals who are able to integrate theoretical knowledge and analytical skills in diverse areas of Food Science.**
- 2. To make students and faculties updated with advance techniques and to introduce the students to dynamic environment of food science.**
- 3. To conduct cutting-edge interdisciplinary research.**
- 4. Introduction of various skill development and entrepreneurship courses to enhance the employability and providing opportunities for industry-academia collaboration.**

1.3 Programme Educational Objectives (PEO)

1.3.1 Writing Programme Educational Objectives (PEO)

Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

- PEO1: The graduate students will understand of various food preservation techniques and concepts and phenomena in the minds of students through theoretical and practical knowledge.
- PEO2: Graduate students will upgraded with new discoveries in Food Science and inculcate continuous learning and self-improvement so that students are motivated for higher studies and research.
- PEO3: Graduate students will be taught various Food Standards and techniques as well as applications of these techniques for betterment of society and environment.
- PEO4: Graduate students will industry- or academia-ready by developing independent thinking, good communication and scientific skills and to acquaint them with professional ethics so that they can work well in an industrial or academic environment.
- PEO5: Graduate students will understand interdisciplinary nature of research in Food Sciences/Food Safety by assigning them different research projects/ case studies/ presentations.

1.3.2 Map PEOs with Mission Statements:

PEO Statements	School Mission 1	School Mission 2	School Mission 3	School Mission 4
PEO1:	3	2	-	-
PEO2:	3	2	2	-
PEO3:	3	3	2	1
PEO4:	2	3	2	2
PEO5:	3	2	2	2

1.3.2.1 Map PEOs with Department Mission Statements:

PEO Statements	Department Mission 1	Department Mission 2	Department Mission 3	Department Mission 4
PEO1:	3	1	1	1
PEO2:	3	3	2	2
PEO3:	2	2	2	2
PEO4:	3	-	2	3
PEO5:	3	2	3	2

1.3.3 Program Outcomes (PO's)

PO1: Knowledge: Students will develop a sound understanding the Food Preserve Techniques and processes.

PO2: Skill Set Development: The student will be skilled in various Food Quality Analysis techniques that will enhance the employability of the students.

PO3: Oral Communication and Scientific Writing: The students will be able to demonstrate good oral communication. Students will also be knowledgeable about writing technical (project report and reviews) content.

PO4: Environment and Sustainable Development: Student will be able to realize the effect of human malpractices on environment and the need and importance of sustainable development.

PO5: Ethics, Independent Thinking and Team Work: The students will develop professional ethics and also gain knowledge about various ethical issues associated with Food Science and Technology. Students will learn to think and analyze a problem independently while at the same time realizing the importance of team work in carrying out successful research/projects/ presentations.

1.3.4 Mapping of Program Outcome Vs Program Educational Objectives

Mapping	PEO1	PEO2	PEO3	PEO4	PEO5
PO1	3	2	2	2	2
PO2	3	2	2	3	2
PO3	1	1	-	3	2
PO4	1	2	3	-	2
PO5	1	2	-	3	2

1.3.5 Program Outcome Vs Courses Mapping Table:

1.3.5.1 COURSE ARTICULATION MATRIX

Cos	PO1	PO2	PO3	PO4	PO5
BFS101	3	1	1	-	1
BSP101	3	1	1	-	1
BSB103	2	1	1	1	1
BFS102	3	1	1	-	1
BFP102	3	1	1	-	1
BSB105	3	2	2	-	2
BFS201	3	1	1	-	-
BFS209	3	1	1	-	1
BFS204	3	3	1	1	1
BFS210	3	3	1	1	1
BFS202	3	3	1	-	1
BFP201	3	3	1	-	-
BFP202	2	3	1	-	1
BFS205	3	3	2	2	2
BFS206	3	3	2	2	2
BFS203	3	3	1	1	1
BFS207	3	3	1	2	1
BFS208	3	2	1	-	1
BFP205	-	-	1	3	3
BFP206	3	3	1	-	1
BFS301	3	3	2	2	2
BFS302	3	2	2	-	2
BFS303	3	3	3	1	3
BFS304	3	3	1	-	1
BFP301	-	-	1	3	3
BFP302	3	3	1	1	1
BFS305	3	3	1	-	1
BFS306	3	3	1	1	1
BFS307	3	3	2	-	2
BFS308	3	3	2	1	2
BFS311	3	3	3	1	3
BFP305	3	3	2	1	2
BFP308	3	3	2	1	2



SHARDA UNIVERSITY

School: SBSR

Batch: 2020-23

Program / Branch/Specialization: B.Sc. Food Science and Technology

Sem.: I

S. No.	Paper ID	Course Code	Course Name	Teaching Load			Credits
				L	T	P	
THEORY COURSES							
1	30577	BSL 101	Essentials of Chemistry for Biosciences	4	0	0	4
2	30214	BFS 101	Principles of Nutrition Science (C)	4	0	0	4
3	30066	BSB103	Biomolecules	4	0	0	4
4	16254	APR101	Communicative English	4	0	0	4
PRACTICAL COURSES							
5	30578	BSL 151	Chemistry Lab for Biosciences-1	0	0	2	1
6	30606	BSP 101	Principles of Nutrition Science Lab	0	0	2	1
			Total Credits	16	0	4	18
TOTAL CREDITS							18



SHARDA UNIVERSITY

School: SBSR

Program / Branch/Specialization: B.Sc. (H) Food Science and Technology

Sem.: II

S. No.	Paper ID	Course Code	Course Name	Teaching Load			Credits
				L	T	P	
THEORY COURSES							
1		PHY115	Physics V9 (GE)	4	0	0	4
2		MSM 104	Probability and Statistics	4	0	0	4
3		BFS 102	Introduction to Food Technology (C)	4	0	0	4
4		EVS 103	Environmental Sciences	3	0	0	3
5		BSB 105	Microbiology	4	0	0	4
6		OPE	University Elective	2	0	0	2
PRACTICAL COURSES							
7.		PHY151	Physics Lab (GE)	0	0	2	1
8.		BFP 102	Introduction to Food Technology Lab	0	0	2	1
			Total Credits	21	0	4	23
TOTAL CREDITS							23



SHARDA UNIVERSITY

School: SBSR



Program / Branch/Specialization: B.Sc. Food Science and Technology

Sem.: III

S. No.	Paper ID	Course Code	Course Name	Teaching Load			Credits
				L	T	P	
THEORY COURSES							
1	30333	BFS 201	Food Chemistry	4	0	0	4
2	30334	BFS 202	Food Biotechnology	4	0	0	4
3	30601	BFS209	Human Health and Diseases	4	0	0	4
4	30336		Food Microbiology	4	0	0	4
5	30602	BFS 210	Nutrition Science and Human Physiology	4	0	0	4
PRACTICAL COURSES							
6	30337	BFP 201	Food Biotechnology and Food Microbiology Lab	0	0	3	2
7	30338	BFP 202	Food Chemistry and Processing Lab	0	0	3	2
			TOTAL CREDITS	20	0	6	24
TOTAL CREDITS							24



SHARDA UNIVERSITY

School: SBSR

Program / Branch/Specialization: B.Sc. Food Science and Technology

Sem.: IV

S. No.	Paper ID	Course Code	Course Name	Teaching Load			Credits
				L	T	P	
THEORY COURSES							
1	30425	BFS 205	Food Quality Analysis	4	0	0	4
2	30426	BFS 206	Processing Technology of Cereals, Pulses Legumes and Oilseeds	4	0	0	4
3	30335	BFS-203	Unit Operations in Food Processing	4	0	0	4
4	30427	BFS 207	Principles of Food Preservation	4	0	0	4
5	30428	BFS 208	Food Enzymology	4	0	0	4
6	--	OPE	University Elective	2	0	0	2
PRACTICAL COURSES							
1	30430	BFP 205	Food Preservation Lab	0	0	3	2
2	30429	BFP 206	Processing Technology of Cereals, Pulses Legumes , Oilseeds and Enzymes technology Lab	0	0	3	2
			TOTAL CREDITS	22	0	6	26
TOTAL CREDITS							26



SHARDA UNIVERSITY

School: SBSR

Program / Branch/Specialization: B.Sc. Food Science and Technology

Sem.: V

S. No.	Paper ID	Course Code	Course Name	Teaching Load			Credits
				L	T	P	
THEORY COURSES							
1	30502	BFS301	Technology of Fruits and Vegetables	4	0	0	4
2	30503	BFS302	Technology of Spices and Functional Foods	4	0	0	4
3	30504	BFS303	Food Packaging	4	0	0	4
4	30505	BFS304	Food Engineering	4	0	0	4
5	45640	CCU401	Community Connect	0	0	8	2
PRACTICAL COURSES							
1	30506	BFP 301	Technology of Fruits and Vegetables Lab	0	0	3	2
2	30507	BFP 302	Technology of Spices and Functional Foods lab	0	0	3	2
3	30985	BFP 312	Project Training	0	0	4	3
			Total Credit	16	0	18	25
TOTAL CREDITS							25



SHARDA UNIVERSITY

School: SBSR



Program / Branch/Specialization: B.Sc. Food Science and Technology

Sem.: VI

S. No.	Paper ID	Course Code	Course Name	Teaching Load			Credits
				L	T	P	
THEORY COURSES							
1	30571	BFS305	Dairy Technology	4	0	0	4
2	30572	BFS306	Technology of Meat, Poultry and Sea Foods	4	0	0	4
3	30573	BFS307	Food Safety and Regulations	4	0	0	4
4	30574	BFS308	Waste Management in Food Industries	4	0	0	4
5	30984	BFS311	Research Methodology In Food Science	4	0	0	4
6	31082	BFP313	Project				3
PRACTICAL COURSES							
1	30575	BFP305	Dairy Technology Lab	0	0	3	2
2	30576	BFP 308	Technology of Animal Foods Lab	0	0	3	2
			Total Credit	20	0	14	27
TOTAL CREDITS							27

Principles of Nutrition Sciences: BFS101

School: SBSR		Batch : 2018-2021	
Program: B.Sc		Current Academic Year: 2018-19	
Branch: Food Science and technology(H)		Semester: 01	
1	Course Code	BFS101	
2	Course Title	Principles of Nutrition Sciences	
3	Credits	4	
4	Contact Hours (L-T-P)	4-0-0	
	Course Status	Compulsory	
5	Course Objective	To develop basic knowledge of food as nutritional component, its related disorders, food hygiene and regulatory laws.	
6	Course Outcomes	After successfully completion of this course students will be able to: 1. Define food and its nutritional value. 2. Provide an overview of the major macro and micronutrients relevant to human health 3. Comprehend the importance of nutrition in health and disease. 4. Discuss the scientific rationale for defining nutritional requirements in healthy individuals and populations, with reference to specific conditions such as pregnancy, lactation, and older age. 5. Describe the role of microbes in food industry. 6. Identify and understand the role personal hygiene and food sanitation in food processing.	
7	Course Description	This course has been designed to make student understand the value nutritional requirements and the role of food sanitation, safety in food manufacturing.	
8	Outline syllabus		CO Mapping
	Unit 1	Components of food	CO1,CO2,CO4
	A	Introduction of Food	
	B	Major nutrition in food: Carbohydrates, Lipids, proteins	
	C	Micro components of Food including minerals and trace elements	
	Unit 2	Food Disorders	CO3,CO4
	A	Food proteins disorders;	
	B	Food Carbohydrate and lipids disorders;	
	C	Food trace elements disorders	
	Unit 3	Growth of Microorganisms in Food	CO5
	A	Food as a substrate for microorganisms;	
	B	Factors affecting growth of microbes;	
	C	Use of Microbes in Food industry	
	Unit 4	Food Safety Aspects	CO6
	A	Personal Hygiene procedures	

	B	Food Safety guidelines			
	C	Food regulatory agencies and laws			
	Mode of examination	Theory			
	Weight age Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Food Science - Fifth Edition Norman N. Potter Springer			
	Other References	2. Essentials of Food & Nutrition by Swaminathan, Vol. 1 & 2 (2012). 3. Frazier, W. C. and Westhoff, D. C. (2007) Food Microbiology. Tata McGraw Hill Publishing Company Ltd. New Delhi			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Principles of Nutrition Science Lab: BSP101

School: SBSR		Batch: 2018-2021
Program: B.Sc.		Current Academic Year: 2018-19
Branch: Food Science and Technology		Semester: 1
1	Course Code	BSP101
2	Course Title	Principles of Nutrition Science Lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	<ul style="list-style-type: none"> To develop practical knowledge about different food nutrition. To demonstrate the importance of food nutrition in human.
6	Course	After successfully completion of this course students will be able to:

	Outcomes	CO1: Identify the starch foods. CO2: Identify the sugary foods. CO3: Identify the presence of fat and protein in food products. CO4: Estimate the moisture and ash content of food products. CO5: Compare the different food products on the basis of nutrients. CO6: Understand the principles of nutrition science.		
7	Course Description	This course presents the fundamental scientific principles of human nutrition. Students will become familiar with food sources; recommended intake levels, disorder related to food deficiency, microbial spoilage of food and safety aspects of food.		
8	Outline syllabus	CO Mapping		
	Unit 1	Practical related to starch.		CO1, CO6
	A	Identify the presence of starch in the given sample.		
	B	Identify the adulteration of food product with starch.		
	C	Isolation of starch from cereals/legumes		
	Unit 2	Practical related to presence of sugar.		CO2, CO6
	A	Identify the presence of reducing sugar in given sample.		
	B	Estimation of non-reducing sugar in given sample.		
	C	Estimation of total sugar in given sample.		
	Unit 3	Practical related to presence of fat and protein.		CO3, CO6
	A	Estimation of fat in given sample.		
	B	Estimation of protein in given any flour sample.		
	C	Estimation of protein in milk sample.		
	Unit 4	Practical related to moisture content and ash content.		CO4, CO6
	A	Determination of moisture content in given sample.		
	B	Determination of ash content in given sample.		
	C	Determination of ash content in given sample.		
	Unit 5	Practical related to comparison of different food products.		CO5, CO6
	A	Compare the level of vitamin C in different food products.		
	B	Compare the sweetness of different varieties of apples.		
	C	Compare the level of iron in different breakfast cereals.		
	Mode of examination	Practical and Viva		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	1. Bevier, I. (1914). <i>Food and Nutrition Laboratory Manual</i> . Boston: Whitcomb & Barrows.		
	Other References			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Biomolecules: BSB103

School : SBSR		Batch : 2018-2021
Program : B.Sc.		Current Academic Year: 2018-19
Branch : Food Science		Semester: 01
1	Course Code	BSB103
2	Course Title	Biomolecules
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory /Elective/Open Elective
5	Course Objective	1. To study the structure and function of macromolecules present in biological systems. 2. Understanding the general properties of lipids, amino acids and carbohydrates. 3. To learn the hierarchical level of proteins 4. To study the mechanism of biosynthesis of purines and pyrimidines
6	Course Outcomes	After studying this course, students will be able to 1: Summarize structural chemistry and general properties of lipids 2: Distinguish the structure, classification and significance of carbohydrates 3: Analyze the structure and properties of amino acids and proteins 4: Evaluate the structure of nucleosides and nucleotides and stability of DNA backbone 5: Illustrate the biosynthesis of purines and pyrimidines and structure as well as properties of DNA and RNA 6: Summarize the structure, properties and significance of biological macromolecules
7	Course Description	This course comprises of the structure, function, properties and significance of various macromolecules found in biological systems.

		Several different macromolecules viz. lipids, carbohydrates, amino acids, proteins, and nucleic acids will be studied in details.			
8	Outline syllabus				CO Mapping
	Unit 1	Lipids			CO1, CO6
	A	Structure and chemistry of fatty acids			
	B	Saturated and unsaturated fatty acids			
	C	General properties and structures of phospholipids, sphingolipids and cholesterol			
	Unit 2	Carbohydrates			CO2, CO6
	A	Carbohydrate classification, Monosaccharides; D- and L- designation, Open chain and cyclic structures			
	B	Structure and biological importance of disaccharides			
	C	Structural polysaccharides and storage polysaccharides			
	Unit 3	Proteins			CO3, CO6
	A	Amino Acids			
	B	Classification, Structure and Properties; Proteins: Primary, Secondary,			
	C	Tertiary and Quaternary Structure; Biological functions of proteins			
	Unit 4	Nucleic Acids			CO4, CO6
	A	Nature of nucleic acids, Structure of purines and pyrimidines			
	B	Nucleosides and Nucleotides			
	C	Stability and formation of phosphodiester linkages			
	Unit 5	Structure of DNA			CO5, CO6
	A	Biosynthesis of purines and pyrimidines			
	B	Structure of DNA and RNA			
	C	Watson-Crick model, Types of DNA			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	Nelson D.L., and Cox M.M., <i>Lehninger Principles of Biochemistry</i> , 6 th Edition. W. H. Freeman (2012).			
	Other References	1. Berg J.M., Tymoczko J.L., and Stryer L., <i>Biochemsitry</i> , 7 th Edition. W. H. Freeman (2010). 2. Voet D., and Voet J.G., <i>Biochemistry</i> , 4 th Edition. Wiley (2010).			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Introduction to Food Technology: BFS102

School: SBSR		Batch : 2018-2021
Program: B. Sc.		Current Academic Year: 2018-19
Branch: Food Science and Technology (H)		Semester: 02
1	Course Code	BFS102
2	Course Title	Introduction to Food Technology
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objective	The course is designed to prepare students with a basic understanding of food processing and preservation techniques involved in food sciences. The course provides a foundation for introduction of various important topics of food sciences.
6	Course Outcomes	After the successful completion of this course students will be able to: 1. Discuss historical development of food science, technology, and the effects of processing on foods. 2. Explain the processing of cereals, pulses, milk and meat products. 3. Recognize the thermal and non-thermal methods of food processing. 4. Review potential applications of processing and preservation in food technology. 5. Describe use of microbes in food industries. 6. Explain the processing, nutritional values and packaging of food products.
7	Course Description	The aim of the course is to take a multidisciplinary approach by integrating advances in food science and food processing in order to

		introduce students to the main principles of science and technology and their implementation in the food industry.			
8	Outline syllabus				CO Mapping
	Unit 1	General Introduction			CO1, CO2
	A	Historical development of food science and technology			
	B	Evolution of Food Processing			
	C	Introduction to various branches of Food Science and Technology			
	Unit 2	Introduction to Plant and Animal derived foods			CO2, CO4
	A	Classification, processing and nutritional value: Plant derived: Cereals, pulses, fruits, vegetables			
	B	Classification, processing and nutritional value: fats and oils; Animal derived: Meat, poultry, fish, milk and milk products;			
	C	Beneficial microbes in Food			
	Unit 3	Introduction to Food processing and preservation			CO3, CO4
	A	Minimal processing of foods with thermal and non-thermal methods; Ohmic heating and High Pressure processing; Freezing, drying and dehydration and irradiation procedures			
	B	Safety criteria in minimally processed foods			
	C	Minimal processing in practice fruits and vegetables, seafood-effect on quality, Future developments			
	Unit 4	Introduction to Food packaging			CO6
	A	Objectives of packaging			
	B	flexible packaging			
	C	Brief description of packaging of frozen products, dried products, fats and oils and thermally processed foods			
	Unit 5	Properties of the packaging materials			CO6
	A	Use of low density polyethylene, ethylene acrylic acid, ethylene methacrylic acid, ionomers			
	B	High density polyethylene, polypropylene ,polyvinyl chloride, polyvinylidene chloride, ethylene vinyl alcohol, polystyrene			
	C	Polyethylene terephthalate or nylon, ethylene vinyl acetate for food packaging			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Manay, S. & Shadaksharaswami, M., Foods: Facts and Principles, NewAge Publishers, 2004			
	Other	1. B. Srilakshmi, Food science, New Age			

	References	Publishers,2002 2. Essentials of Food & Nutrition by Swaminathan, Vol. 1 & 2 (2012) 3. Marriott, Norman G. Principles of Food Sanitation, AVI, New York, 1985	
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Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Introduction to Food Technology Lab: BFP102

School: SBSR	Batch: 2018-2021
Program: B. Sc	Current Academic Year: 2018-19
Branch: Food Science and Technology	Semester: 02
1	Course Code BFP102
2	Course Title Introduction to Food Technology Lab
3	Credits 1
4	Contact Hours (L-T-P) 0-0-2
	Course Status Compulsory
5	Course Objective <ul style="list-style-type: none"> To understand the sampling of milk products. To learn the importance of proximate analysis.
6	Course Outcomes <p>After successful completion of this course, students will be able to:</p> 1: Learn the quality assessment of milk. 2: Understand the importance of testing procedures for cereal and related products. 3: Demonstrate common food testing techniques. . 4: Explain the importance of various chemicals preservatives in preservation.

		5: Recognize the importance of microbiological analysis in fruits and vegetables. 6: Study the packaging and labelling requirements of processed foods.		
7	Course Description	In this course, students will deal with various quality aspects of food products.		
8	Outline syllabus			CO Mapping
	Unit 1	Practical based on effect of heat and pH on color and texture of green vegetables.		CO1
	A	To study the effect of heat on colour/texture of fruit		
	B	To evaluate the texture of effect of heat on colour/texture of vegetables		
	C	To estimate the pH of heat processed food sample		
	Unit 2	Practical related to estimation of gluten content present in a different samples		CO2
	A	To analyse the wet gluten content of wheat		
	B	To analyse the dry gluten content of wheat		
	C	To analyse the wet/dry gluten content of rice		
	Unit 3	Practical related to evaluation of milk products.		CO3
	A	To test the fat content in milk products		
	B	To check the protein content in milk products		
	C	To estimate the acidity/pH of the milk product		
	Unit 4	Practical related to development of different types of fruit and vegetable based products		CO4
	A	Development of Jam		
	B	Development of ketchup		
	C	Development of tomato puree		
	Unit 5	Practical related to estimation of carbohydrates in different food samples.		CO5
	A	To estimate carbohydrates in cereals		
	B	estimation of carbohydrates in fruits/vegetables		
	C	Estimation of CHO content in legumes		
	Mode of examination	Practical and Viva		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	FSSAI Manual for Analysis for Food Products.		
	Other References			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Microbiology: BSB105

School: SBSR		Batch : 2018-2021
Program: B.Sc		Current Academic Year: 2018-19
Branch: Food Science and Technology (H)		Semester:02
1	Course Code	BSB105
2	Course Title	Microbiology
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Core
5	Course Objectives	<p>This course has been designed to make students understand the basic characteristics of microbes.</p> <p>2. To know about basis principle and to understand the methods of sterilization.</p> <p>3. Students understand the basic structure of Bacteria</p>
6	Course Outcomes	<p>After successfully completion of this course students will be able to:</p> <p>1: To study the history of microbiology and its basic concepts.</p> <p>Structure and nutrition of bacteria.</p> <p>2: Growth, multiplication, factors affecting growth of bacteria and techniques related to its isolation.</p> <p>3: Principles of physical and chemical methods used in the control of microorganisms.</p> <p>4: Prevention and control of microbial diseases.</p> <p>5: Elaborate Structure and life cycle of bacteriophage and virus.</p> <p>6: Application of microorganisms in different industries that can benefit human</p>

7	Course Description	Microbiology course outlines the general characteristics of different microorganisms and also provides the basic knowledge of significance of different microbes affecting the human beings.		
8	Outline syllabus			CO Mapping
	Unit 1	Introduction to Microbiology		CO1, CO6
	A	History of Microbiology & contribution of microbiologists		
	B	Spontaneous generation; Koch Postulates		
	C	Whittaker's 5 kingdom concept; Pasteurization.		
	Unit 2	Morphology and Nutrition of Bacteria		CO2, CO6
	A	Morphology and fine structure of Bacteria; outer surface of bacteria; Cell wall of Gram +ve and Gram -ve bacteria		
	B	Nutritional classification of Bacteria		
	C	Brief overview on Archea; Cyanobacteria, PPLO		
	Unit 3	Growth and Sporulation in Bacteria		CO3 , CO6
	A	Modes of cell division (Binary fission; budding and Septum formation); Normal growth of bacteria; Growth curve		
	B	Pure culture, Method of isolating pure culture (Streak method, Pour-plate and spread plate technique); Synchronous and asynchronous		
	C	Growth inhibitory substances (temperature, acidity, alkalinity, water availability, oxygen)		
	Unit 4	Control of Microbial Growth		CO4, CO6
	A	Microbes and Human welfare (medical and chemical industry)		
	B	Microbes in food industry		
	C	Physical and chemical methods of control of microorganisms		
	Unit 5	Virus and Its Control		CO5, CO6
	A	Ultra-structure of Virus		
	B	Life Cycle and its control		
	C	Life cycle of Bacteriophage		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Microbiology - Pelezar, M.J. Reid, R.D. and E.C.S. Chan, Tata Mc Graw Hill, New Delhi.1977 (4 th Edition)		
	Other References	1. Prescott, Harley and Kelvin – Microbiology, 2nd ed. TMH Publication 2. General Microbiology: Roger & Strainer et.al. PHL Publication		

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Food Chemistry: BFS201

School: SBSR		Batch : 2018-2021
Program: B.Sc		Current Academic Year: 2019-20
Branch: Food Science and Technology		Semester: 3
1	Course Code	BFS 201
2	Course Title	Food Chemistry
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objective	1. To introduce the Food Chemistry and its industrial application. 2. To develop the knowledge of Food Chemistry. 3. To set up appropriate examples for food chemistry in terms of use in food products 4. To develop the knowledge of chemistry behind food.
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Comprehend the basic chemistry concept of carbohydrates, proteins and fat. Basic understanding chemistry with food CO2: Develop idea for chemistry of gums, polysaccharides for industrial purpose. CO3: Different parameters use to evaluate carbohydrates, proteins and fat. CO4: Carbohydrate and their role in food. Anti-nutritional factors CO5: Differentiation among enzymes and enzyme activity CO6: Recognize the importance and utility of Food chemistry in food. Food chemistry used in food preservation and chemicals
7	Course Description	Food Chemistry is an application of various nutrient and non-nutrients found in food and their end use till digestion. The types of molecules separated from

		plant introduce beneficial as additives in food preservation. In the future Food Chemistry could offer foods with higher vitamin levels, longer shelf lives or the ability to retain as fresh even in the face of climate change. In this course, students will learn about the different bimolecular and techniques/ methods used as ingredients/ material and their use.		
8	Outline syllabus	CO Mapping		
	Unit 1	Carbohydrates		
	A	Introduction, Definition and functions		
	B	Classification of Carbohydrates		
	C	Carbohydrates function, types and use		
	Unit 2	Proteins and Amino acids		
	A	Protein types, classification		
	B	Physical and chemical functions		
	C	Protein denaturation, Milk, meat and Egg proteins		
	Unit 3	Lipids (oil and fats)		
	A	Lipids classification		
	B	Physico-Chemical properties of oil and fats		
	C	Chemistry, functions and application of emulsifiers		
	Unit 4	Anti-nutritional factors of foods		
	A	Antioxidants, stabilizers and additives		
	B	Chemistry and functional properties of pigments and flavour compounds (Flavanoids)		
	C	Enzyme inhibitors, Trypsin and chymotrypsin inhibitor		
	Unit 5	Enzymes and starches		
	A	Enzymes-Modified starches, resistant starches, gelatinization of starches		
	B	Alpa-Beta amylase, Reactions of aldehydes and Ketones with amino compound		
	C	Oxidative changes of polyphenols and their application		
	Mode of examination	Theory		
	Weightage Distribution	CA 30%	MTE 20%	ETE 50%
	Text book/s*	1. Meyer, L.H.(1998) Food Chemistry, Van Nostrand, Reinhold Company Publication, New York , London.		
	Other References	2. Pomeranz, Y and Melon, R. (1995) Food Analysis: Theory and Practice, Westport, An AVI Publication, New York, Sydney, Toronto. 3. Fernnema, R.O (1997) Food Chemistry, Second Edition, Food Science & Technology series Marcel Dekker, INC., New York		

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

HUMAN HEALTH AND DISEASE: BFS209

School: SBSR		Batch : 2018-2021
Program: B. Sc		Current Academic Year: 2019-20
Branch: Food Science and Technology		Semester: 3
1	Course Code	BFS209
2	Course Title	Human Health and Disease
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objective	1. Understanding about human physiology. 2. Importance and need of health. 3. Basic concepts of nutrition and its role in health. 4. Types of diseases 5. New initiative in promoting health.
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Comprehend the basic concept of health. CO2: Nutritional methods and. Recognized methodology for assessment of health CO3: Role of nutrients to measures energy. CO4: Types and various nutritional programmes CO5: Dietary management
7	Course Description	Health and Disease is an application of food science and nutrition. The types of methods applied during identification, characterization are beneficial in development of growth and health. In depth knowledge with its applicable techniques. In this course, students will learn about the role of food Quality in maintains of health .
8	Outline syllabus	CO Mapping

	Unit 1	Basics of Health			CO1,
	A	Definition, concept and dimensions of health, Disease-concepts, classification,			CO1,
	B	Food and Its Role, Factors influencing health: Causes and risk factors for developing illness,			CO1, CO2
	C	Maintenance of health. Digestion, Absorption and transport and excretion of nutrients.			CO1
	Unit 2	Nutrition and health			CO2, CO3
	A	Elements of nutrition (Macro and micro nutrients), role of nutrition in maintaining health Balanced diet and its composition,			CO2
	B	Classification of foods (Body building, energy giving and protective foods),			CO2
	C	Calorific value, Recommended Dietary Allowances (RDA)			CO2
	Unit 3	Nutrition Related Disorders			CO3, CO6
	A	Nutritional problems in India, National Nutrition policy, Factors affecting food and nutrition			
	B	Major Deficiency Diseases-I: PEM and Xerophthalmia, Major Deficiency Diseases-II: Anaemia			
	C	Iodine Deficiency Disorders, Other Nutritional Problems.			
	Unit 4	Nutrition Programmes			CO4
	A	Nutrient Deficiency Control, ICDS, Supplementary Feeding Programme,			CO4
	B	Assessment of Nutritional Status, Health Promotion and levels of disease Prevention,			CO4
	C	Hygiene practices, importance of Hygiene for disease prevention and factors influencing hygiene practice			CO4
	Unit 5	Nutrition and Infection			CO5,CO6
	A	Dietary Management of Obesity			CO5,CO6
	B	Coronary Heart Disease and Diabetes Mellitus, Maternal Malnutrition			CO5,CO6
	C	Nutritive value of Indian Foods			CO5,CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	<i>Food and Nutrition Vol-1 and Vol- 2, Dr. M.Swami Narthan.</i>			
	Other References	<i>NIN- Nutritive value of Indian Foods.</i>			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Food Microbiology: BSF204

School: SBSR		Batch : 2018-2021
Program: B.Sc		Current Academic Year: 2019-20
Branch: Food Science and Technology (H)		Semester: 03
1	Course Code	BSF204
2	Course Title	Food Microbiology
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objective	To develop knowledge of different groups of microbes and getting an overall idea of food-borne microbes involved in beneficial and harmful activities
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Identify microbes associated with food, their classification and factors affecting their growth. CO2: Describe fermented foods and their microflora CO3: Compare food spoilage in different classes of food CO4: Examine and detect food-borne pathogens CO5: Recognize microbial destruction methods CO6: Develop an overall idea of food-borne microbes involved in beneficial and harmful activities and methods of influencing their growth and survival.
7	Course Description	This course has been designed to make student understand the microbes involved in food production and for causing the food-borne microbes
8	Outline syllabus	CO Mapping

	Unit 1	Microorganisms of Food			CO1,CO6
	A	History of Food Microbiology			
	B	Microorganisms associated with foods; Bacteria, fungi, viruses, protozoa, toxic algae, Microbial grouping in practice			
	C	Extrinsic and Intrinsic Factors affecting Microbial Growth			
	Unit 2	Fermented and microbial foods			CO2,CO6
	A	Fermented and microbial foods: Fermented Milk and milk products, Single cell protein,			
	B	Fermented fruits and vegetables, Fermented fish, Fermented meats			
	C	Fermented beverages- Beer, Vinegar and Wine, Concept of Probiotics and health benefits			
	Unit 3	Food Spoilage			CO3
	A	Spoilage of different foods types- Cereal and its products, Vegetables, fruits, and its products			
	B	Milk and its products			
	C	Meat and meat products, poultry, fish and sea foods and Drinking water			
	Unit 4	Diagnosis			CO4; CO6
	A	Detection of food-borne organisms and diseases			
	B	Concept of Metabolically injured organisms their examination			
	C	Bioassays for detecting microbes			
	Unit 5	Destruction of microorganisms			CO5; CO6
		Principles underlying the destruction of microorganisms			
		Destruction of microorganisms by physical and chemical methods Heating process, Irradiation, Low temperature storage			
		Bioassays for detecting microbes			
	Mode of examination				
	Weight age Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Frazier, W. C. and Westhoff, D. C. (2007) Food Microbiology. Tata McGraw Hill Publishing Company Ltd. New Delhi. 2. Adams, M. R. and Moss, M. O. (2005) Food Microbiology (Second edition).Royal Society of Chemistry Publication, Cambridge.			
	Other References	3. Jay, J.M. (2008) Modern Food Microbiology (Sixth Edition).Aspen Publishers, Inc. Gaithersburg, Maryland.			

		4. Ray, B. (2005) Fundamental food microbiology (Third edition). CRC Press, New York, Washington.	
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Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Nutrition Science and Human Physiology: BFS210

School: SBSR		Batch : 2018-2021
Program: B.Sc		Current Academic Year: 2019-20
Branch: Food Science and technology(H)		Semester: 03
1	Course Code	BFS210
2	Course Title	NUTRITION SCIENCE AND HUMAN PHYSIOLOGY
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objective	To develop Knowledge of the Structure and Function of cardio, Gastrointestinal Reproductive system and Relevance of Food with Physiology.
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Illustrate the Structure and Function of the Heart, Cardiac cycle, Blood Pressure, and BMR Concept. CO2: Summarize Structure and Function of Gastrointestinal Physiology. CO3: Describe the Actions and Disorders of Exocrine and Endocrine System. CO4: Knowledge of the Structure and Function of Reproductive Physiology and Relevance of Food with Physiology. CO5: Explain the concepts of Health, Disease, and its Prevention and the Basic Concept of Disease. CO6: Knowledge of the general terminology of WHO, Disease Prevention and Transmission.
7	Course	This course has been designed to make student understand the Relevance of

	Description	Food with Physiology.		
8	Outline syllabus			
	Unit 1	Human Physiology		
	A	Cardio- Respiratory Physiology		
	B	Blood -Composition and function, Anemia, Jaundice, Blood circulations (systemic, pulmonary, coronary and portal), Cardiac cycle, Cardiac output, Blood pressure		
	C	Structure of lungs and its function, Lung volume and Capacities. Concept of BMR		
	Unit 2	Gastrointestinal Physiology		
	A	Structure of stomach, liver, gallbladder, pancreas and their functions		
	B	Composition, function and regulation of GI secretions		
	C	Neuro- Endocrine Physiology		
	Unit 3	Organization Of Nervous System		
	A	Actions and disorders of Pituitary		
	B	Thyroid and Parathyroid		
	C	Adrenal and Pancreatic hormones.		
	Unit 4	Renal And Reproductive Physiology		
	A	Structure of kidney and its function		
	B	Physiology of Pregnancy and lactation		
	C	Mental Health, Relevance of Food with Physiology		
	Unit 5	Promotive Health		
		Concept of health, Disease and its Prevention		
		WHO definition of Health, Basic concept of Disease and Disease transmission		
		Definition of Public Health and Disease Prevention		
	Mode of examination			
	Weight age Distribution	CA 30%	MTE 20%	ETE 50%
	Text book/s*	1) Ganong WF (2003). Review of Medical Physiology, 21st ed. McGraw Hill. J.E. Park and K. Park (2009). 2) Park's Textbook of Preventive and Social Medicine, 20th edition. M/s Banarsi Das Bhanot, Jabalpur		
	Other References	3) Ross and Wilson (1973). Foundation of Anatomy and Physiology, Medical Division of Longman Group Ltd		

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Food Biotechnology: BFS202

School: SBSR		Batch : 2018-2021
Program: B.Sc.		Current Academic Year: 2019-20
Branch: Food Science and Technology		Semester: 3
1	Course Code	BFS202
2	Course Title	Food Biotechnology
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objectives	1. To train the students about the basic principles, application of food biotechnology. 2. To develop knowledge of downstream processing in food industry. 3. To acquaint students with biotechnology and industrial production of different food product
6	Course Outcomes	CO1: Understand the basic principles, application, safety, regulations and Food authentication methods of food biotechnology. CO2: Understand fundamentals of downstream processing and biosensors in food industry CO3: Understand natural control of micro-organism and production with control of Aflatoxin CO4: Understand all about GMOs and Protein Engineering applications in food industry CO5: Understand the biotechnology and industrial production of different food product CO6: Biotechnology is tool for various quality measurements in food products like PCR, Immunological methods and DNA based methods.

		Biotechnology offers various purification operations for food products. Fermented food products manufacturing are based on biotechnology.	
7	Course Description	Biotechnology is tool for various quality measurements in food products like PCR, Immunological methods and DNA based methods. Fermented food products manufacturing are based on biotechnology.	
8	Outline syllabus		CO Mapping
	Unit 1	Food Biotechnology	CO1, CO6
	A	Introduction to Food Biotechnology, basic principles of Gene technology and its application in food industry.	CO1, CO6
	B	Food safety and biotechnology- Impact of Biotechnology on foods	CO1, CO6
	C	Impact of Biotechnology on foods .Real time PCR based methods	CO1, CO6
	Unit 2	Downstream processing	CO2, CO6
	A	Principle and types of downstream processing of food products, General types and stages in downstream processing	CO2, CO6
	B	Bacterial starter culture, Methods of inoculation, media preparation, Slurry processing and product isolation.	CO2, CO6
	C	Biosensors types and applications in food processing.	CO2, CO6
	Unit 3	Industrial Application	CO3, CO6
	A	Biotechnology and industrial production of enzymes	CO3, CO6
	B	Industrial production of beer, wine, amino acids, organic acids, vitamins	CO3, CO6
	C	Industrial production of baker's yeast, brewer's yeast and single cell protein.	CO3, CO6
	Unit 4	Other Applications of Bio-Technology	CO4, CO6
	A	Applications of bacteriocins in food systems.	CO4, CO6
	B	Various Fermentative Products	CO4, CO6
	C	Other applications	CO4, CO6
	Unit 5	MO	CO5, CO6
	A	Transgenic plants and animals : Current status of transgenic Plants and animals, methods, concept, risks regulation and application	CO5,CO6
	B	Ethical issues	CO5,CO6
	C	Protein engineering in Food technology –objectives, methods, limitations and applications (e.g. Lactobacillus, β -galactosidase, nisin and Glucose isomerase).	CO5,CO6
	Mode of		

	examination				
	Weightage	CA	MTE	ETE	
	Distribution	30%	20%	50%	
	Text book/s*	1. VK Joshi and Ashok Pandey (1999). Biotechnology-Food fermentation, Volume 1&2 Educational publishers and Distributors 2. Tombs, M.P. (1991). Biotechnology in Food Industry, Open University Press, Milton Keynes			
	Other References	3. Lee, B.H. (1996). Fundamentals of Food Biotechnology, VCH Publishers 4. Schwartzberg, A & Rao (1990). Biotechnology & Food Process Engineering			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Food Biotechnology and Food Microbiology Lab: BFP201

School: SBSR		Batch : 2018-2021
Program: B.Sc.		Current Academic Year: 2019-20
Branch: Food Science and Technology		Semester: 3
1	Course Code	BFP 201
2	Course Title	Food Biotechnology and Food Microbiology Lab
3	Credits	2
4	Contact Hours (L-T-P)	0-0-3
	Course Status	Compulsory
5	Course Objectives	1. To train the students about the basic principles, application of food biotechnology and microbiology.

		3. To acquaint students with biotechnology and industrial production of different food product	
6	Course Outcomes	<p>After the successful completion of this course students will be able to:</p> <ul style="list-style-type: none"> • CO1: To gain knowledge of general microbiology laboratory practices. • CO2: To gain hands-on experience with the use of a microscope and microscopic examination. • CO3: To teach students about various staining and culturing/sub-culturing techniques. • CO4: To learn the protocol for estimating the presence of microbes in specific food commodities. • CO5: To apply industrial biotechnology knowledge in food production. 	
7	Course Description	Biotechnology is tool for various quality measurements in food products. Microbiology course outlines the general characteristics of different microorganisms and also provides the basic knowledge of significance of different microbes affecting the human beings.	
8	Outline syllabus		CO Mapping
	Unit 1	Introduction to basic microbiology Laboratory Practices	CO1
	A	Laboratory rules	
	B	Equipment's and Cleaning and Sterilization of glassware's	
	C	Solution preparation	
	Unit 2	Practical related to the study of compound microscope/microscopic examination of microbes	CO2
	A	To study the different parts of compound microscope	
	B	Microscopic examination of microbes in curd	
	C	Microscopic examination of microbes milk	
	Unit 3	Practical related to Staining Techniques	CO3
	A	Principle of staining	
	B	Simple staining	
	C	Gram staining	
	Unit 4	Estimation of microbial count	CO4
	A	To determine the total plate count	
	B	To determine the yeast and mould count	
	C	To determine E. coli count	
	Unit 5	Biotechnology and Industrial production of food products	CO5
	A	Development of cheese	
	B	Development of paneer	
	C	Development of yogurt	
	Mode of		

	examination				
	Weightage	CA	MTE	ETE	
	Distribution	60%	0%	40%	
	Text book/s*				
	Other References	1. Dubey, R. C., & Maheshwari, D. K. (2012). <i>Practical Microbiology</i> . S. Chand Pvt. Limited. 2. Pelczar, M. J., Chan, E. C. S., & Krieg, N. R. Microbiology. (1993). <i>Tata McGraw Hill Publication, New Delhi, India.</i>			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Food Chemistry and Processing Lab: BFP202

School: SBSR		Batch : 2018-2021
Program: B.Sc.		Current Academic Year: 2019-20
Branch: Food Science and Technology		Semester: 3
1	Course Code	BFP202
2	Course Title	Food Chemistry and Processing Lab
3	Credits	2
4	Contact Hours (L-T-P)	0-0-3
	Course Status	Compulsory
5	Course Objectives	1. To introduce the Food Chemistry and its industrial application. 2. To develop the knowledge of Food Chemistry. 3. To set up appropriate examples for food chemistry in terms of use in food products 4. To develop the knowledge of chemistry behind food.
6	Course	After the successful completion of this course students will be able to:

	Outcomes	<ul style="list-style-type: none">• CO1: To educate the students on the significance, purpose and principle of Food Chemistry• CO2: To estimate total carbohydrates, protein, starch, Ash, Moisture Content from different food samples• CO3: To estimate reducing and non-reducing sugars from different food samples.• CO4: To understand the method for determination of pH and acidity from different food samples.• CO5: To understand preparation of Primary and Secondary solutions.• CO6: To understand method of estimation of ascorbic acid in food samples	
7	Course Description	Food Chemistry is an application of various nutrient and non-nutrients found in food and their end use till digestion. The types of molecules separated from plant introduce beneficial as additives in food preservation. In the future Food Chemistry could offer foods with higher vitamin levels, longer shelf lives or the ability to retain as fresh even in the face of climate change. In this course, students will learn about the different bimolecular and techniques/ methods used as ingredients/ material and their use.	
8	Outline syllabus		CO Mapping
	Unit 1	General Laboratory practices/Principle/working of equipment's used in Laboratory	CO1
	A	Principle of general equipment's used in food processing Laboratory	
	B	Working of general equipment's used in food processing Laboratory	
	C	General Laboratory practices and rules	
	Unit 2	Analysis of proximate composition of food	CO2
	A	Determination of moisture content in sample	
	B	Determination of fat content in sample	
	C	Determination of protein content in sample	
	Unit 3	Practical related to Analysis of pH/acidity	CO3
	A	Determination of pH of the food sample	
	B	Solution preparation related to the experiment	
	C	Determination of acidity of the food sample	
	Unit 4	Preparation of Primary and Secondary molar/normal solution	CO4
	A	Preparation of Primary and Secondary solutions	
	B	Preparation of molar solutions	
	C	Preparation of normality solutions	
	Unit 5	Analysis of ascorbic acid content	CO5
	A	Ascorbic acid content in fruits sample	
	B	Ascorbic acid content in vegetable sample	
	C	Ascorbic acid content in food product	

	Mode of examination				
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	1. Serna-Saldivar, S. O. (2012). <i>Cereal grains: Laboratory Reference and Procedures manual</i> . CRC Press. 2. Pomeranz, Y and Melon, R. (1995) <i>Food Analysis: Theory and Practice</i> , Westport, An AVI Publication, New York, Sydney, Toronto.			
	Other References				

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

FOOD QUALITY ANALYSIS: BFS205

School: SBSR		Batch : 2018-2021
Program: B. Sc		Current Academic Year: 2019-20
Branch: Food Science and Technology		Semester: 4
1	Course Code	BFS205
2	Course Title	FOOD QUALITY ANALYSIS
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objective	1. To introduce the Food Quality Attributes and its industrial application.

		<div>2. To develop the knowledge and techniques of evaluation of food products and packaging material used.</div> <div>3. To set up appropriate examples for techniques/methods material selection for food products assessment.</div> <div>4. To develop the knowledge of evaluation and applications in food quality</div>	
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Comprehend the basic concept of food quality assessment and the requirements necessary for its application. CO2: Develop an idea for the appropriate methodologies types of techniques for food quality evaluation purpose. Study of Different parameters use to evaluate sensory attributes of food. Demonstrate experimentally among various scales used for sensory CO3. Application of variation and techniques in Food. Differentiation among methodology. CO4: Recognize the importance and utility of Food attributes CO5: Improved techniques used in industry CO6: Various merits and demerits in modern and traditional techniques	
7	Course Description	Food Quality Analysis is an application of food safety in Food manufacturing. The types of techniques used in quality assurance. In the future Food safety I could possible without use of these modern techniques. In this course, students will learn about the different techniques / methods used for quality assurance and its efficient use in product development.	
8	OUTLINE OF SYLLABUS		CO Mapping
	Unit 1	Quality attributes	CO1 ,CO6
	A	General aspects of Food Quality	CO1
	B	Food Quality Attributes	CO1,
	C	Food Quality Factors and their test <ul style="list-style-type: none">• Colour• Flavour• Texture• Taste	CO1
	Unit 2	Chromatography	CO2,
	A	Chromatography Techniques; Different types of Chromatography Techniques	CO2
	B	Applications of Chromatography Techniques	CO2
	C	HPLC,GC and GC and GC-MS,MS-MS	CO2
	Unit 3	Food Rheology and Viscosity	CO3
	A	Food Rheology and Viscosity determination	CO3
	B	Measurement of viscosity. viscometer	CO3
	C	Measurement of Physical Characteristics of food	CO3
	Unit 4	Sensory evaluation	CO4
	A	Panel selection and panel training	CO4
	B	Sensory Scores and data analysis	CO4
	C	Measurement of texture using different instrument and their working principle	CO4
	Unit 5	Traditional and Modern Analytical Techniques	CO5,CO6
	A	UV-Visible spectroscopy	CO5
	B	Ultrasonic equipments	CO6

C	Magnetic Resonance (NMR);NIR			CO6
Mode of examination	Theory			
Weightage Distribution	CA	MTE	ETE	
	30%	20%	50%	
Text book/s*	1. Handbook of Food Analysis (Vol I & II) (1996) by Leo M.L. Nollet Marcel Dekker, USA. 2. Handbook of Food Analysis.Vol.1. Marcel Dekker			
Other References	3. Eram S.Rao, 2013.Food Quality Evaluation.ISBN:9789381156216 Gruenwedel DW A7 Whitaker JR.1984. 4. Food Analysis Principles and Technique. Vol I, II, III, IV .Biological Techniques Marcel Dekker.			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Processing Technology of Cereals, Pulses and Oilseeds: BFS206

School: SBSR		Batch : 2018-2021
Program: B.Sc		Current Academic Year: 2019-20
Branch: Food Science and technology (H)		Semester: 04
1	Course Code	BFS206
2	Course Title	Processing Technology of Cereals, Pulses and Oilseeds
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objective	To develop the knowledge of structure, processing and importance of major cereals, legumes and oilseed crops
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Students will be to understand the structural nutritional and processing importance of wheat grain.

		CO2: Students will be able to understand the physico-chemical properties of rice grain and importance of parboiling based on its advantages and disadvantages. CO3: To enable the students to gather an overview of other important cereals and their processing aspects CO4: Students will be able to describe about processing of various pulses CO5: Students will be able to have overall idea of oilseeds and processing of vegetable oils and fats. CO6: Students will be able to have overall the importance of major cereals, legumes and oilseed crops	
7	Course Description	Cereals, legumes and oilseeds are important source of food and feed in human life. Therefore overall of these aspects are important to facilitate their better utilization.	
8			CO Mapping
	Unit 1	Wheat	CO1, CO6
	A	Introduction, Structure and composition to cereals, pulses and oilseeds	
	B	Wheat types, physicochemical characteristics, milling of wheat, quality of flour and flour treatment.	
	C	Additives used in bakery products -bleaching agents and flour improvers, Bakery products: bread, biscuits, cakes, extruded products (noodles and pasta).	
	Unit 2	Rice	CO2, CO6
	A	Rice- physicochemical characteristics, Rice Milling ; Parboiling of rice- traditional methods and their drawbacks	
	B	CFTRI process of parboiling, Properties of parboiled rice, Changes during parboiling, Advantages and disadvantages of parboiling	
	C	By- products of rice milling, Rice aging and rice based processed products.	
	Unit 3	Minor Cereals	CO3, CO6
	A	Barley, Oats, Sorghum and Millets processing and their important products	
	B	Corn milling wet and dry method	
	C	Corn products: corn starch, flakes, and hydrolyzed syrups, corn flour, corn oil and baby corn	
	Unit 4	Pulses	CO4, CO6
	A	Types and processing of Legumes (Pulses), Storage and cooking losses	
	B	Sprouting of legumes for nutritional benefits	
	C	Anti-nutritional factors in legumes and methods of removal	
	Unit 5	Oilseeds	CO5; CO6
		Processing- oil extraction/express ion and solvent extraction. Refining of crude oil- degumming, bleaching, deodorizations	

		Preparation of protein concentrates and isolates and their use in high protein foods			
		Hydrogenation and Interesterification, Shortening-introduction, manufacturing and uses of shortening, types of shortening. Margarine			
	Mode of examination				
	Weight age Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1) Chakraverty, A. 1988. Postharvest Technology of Cereals, Pulses and oilseeds. Oxford and IBH, New Delhi. 2) Kent, N.L. 1983. Technology of Cereals. 3rd Edn. Pergamon Press, Oxford, UK. 3) Salunkhe, D. and Deshpande, S.S (2001) Foods of Plant origin : Production, Technology & Human 4) Nutrition An AVI Publications, New York. Pomeranz, Y. 1987. Modern Cereal Science and Technology. VCH Pub., New York.			
	Other References				

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Unit Operation in Food Processing: BFS203

School: SBSR		Batch : 2018-2021
Program: B.Sc.		Current Academic Year: 2019-20
Branch: Food Science and Technology		Semester: 4
1	Course Code	BFS203
2	Course Title	Unit Operation in Food Processing

3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objectives	1. To train the students for the cleaning methods and material handling systems for foods. 2. To develop knowledge for size reduction and mixing unit operation of foods, filtrations and expressions of foods, high and low temperature preservation operations for foods
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Identify cleaning methods and material handling systems for foods CO2: Describe size reduction and mixing unit operation of foods CO3: Apply different methods of filtrations and expressions of foods CO4: Describe high temperature preservation operations for foods CO5: Understand Low temperature preservation unit operations CO6: To have broader idea to the student about Unit operations in food processing
7	Course Description	Food engineers use computers extensively to produce and analyze products, processes, or plant designs; to simulate and test how a machine, or food system operates; and to generate specifications for foods, machinery, or packaging.
8	Outline syllabus	CO Mapping
	Unit 1	Material handling CO1, CO6
	A	Theory, classification. Cleaning – Types of contaminants found on raw foods, methods of cleaning- dry, wet and combination methods. CO1, CO6
	B	Dry cleaning methods: aspiration, screening, magnetic cleaning and abrasive cleaning. CO1, CO6
	C	Wet cleaning methods: soaking, spray washing, flotation washing and ultrasonic washing. Sorting and grading – advantages, methods of sorting and grading. CO1, CO6
	Unit 2	Size reduction and Mixing CO2, CO6
	A	Nature of forces used in size reduction, criteria of size reduction, equipment selection (mechanical structure of feed, moisture content and hardness of feed and temperature sensitivity of feed), open circuit and closed circuit grinding, free crushing, choke feeding and wet milling. CO2, CO6
	B	Size reduction of fibrous foods, solid foods, and liquid foods. Effects of size reduction on food. Mixing – Agitating, kneading, blending, and homogenizing. CO2, CO6
	C	Mixing equipment's – Paddle agitators, turbine agitators propeller agitators, Pan mixer, horizontal mixer and dough mixer, tumbler mixer & vertical screw mixer, effects of mixing on foods. CO2, CO6
	Unit 3	Filtration and Expression CO3, CO6

	A	Filtration methods/equipments – pressure filtration, vacuum filtration, & centrifugal filtration. Feed slurry, filtrate, filter medium, filter cake and filter	CO3, CO6		
	B	Methods of expressing the liquid from solid-liquid food system – hydraulic pressing, roller pressing and screw pressing. Factors affecting efficiency of expression.	CO3, CO6		
	C	Mode of heat transfer – Conduction, Convection, Radiation, Classification, contact type heat exchange and Non-contact type heat exchanger.	CO3, CO6		
	Unit 4	Preservation Unit operations (High Temperature Operations)	CO4, CO6		
	A	Pasteurization- General concept, Pasteurizing equipments	CO4, CO6		
	B	Evaporation – functions of evaporation, factors affecting the rate of heat transfer and economics of evaporation, evaporation equipments – open pans, horizontal tube evaporators, vertical tube evaporator and plate evaporator. Single and multiple effect evaporators.	CO4, CO6		
	C	Dehydration theory. Drying curves. Dehydration systems Tray drier, tunnel drier. Drying time calculations.	CO4, CO6		
	Unit 5	Low temperature Processing	CO5, CO6		
	A	Refrigeration: Introduction, components of refrigeration systems – compressor, condenser, and expansion valve, Mechanical refrigeration system. Principle of refrigeration, Vapour compression refrigeration cycle	CO5, CO6		
	B	Freezing: Principle of freezing & freezing rate, Freezing – Technological principles of freezing operations. Freezing time calculations	CO5, CO6		
	C	Freeze drying – Conventional drying vs freeze drying, equipments used and effects of freeze drying on food quality.	CO5, CO6		
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Earle, R.L. (1983) Unit Operations in Food Processing, 2 nd Edition, Pergamon Press, Oxford, U.K. 2. Singh, R. P. and Heldman, D. R. (1984). Introduction to Food Engg., Academic Press, INC, London. 3. Harper, J.C. (1976) Elements of Food Engg.,			

		AVI Publ. Co., Westport, Connecticut. 4. Toledo, R.T. (1980). Fundamentals of Food Process Engg., AVI. Publ. Co., Westport, Connecticut. 5. Brennan, J.G., Buffers, J.R., Cowell N.D., Lilly, A.E.V. (1976). Food Engg. Operations, 2 nd Ed., Elsevier, New York. 6. Food Processing Technology: Principles and Practice by Peter Fellows (2009) Woodhead Publishing 7. Novel food processing technologies by Gustavo V. Barbosa-Cánovas, María S. Tapia, M. Pilar Cano (2005) CRC Press	
	Other References		

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Principles of Food Preservation: BFS207

School: SBSR		Batch : 2018-2021
Program: B.Sc.		Current Academic Year: 2019-20
Branch: Food Science and Technology		Semester: 4
1	Course Code	BFS207
2	Course Title	Principles of Food Preservation
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course	1. The course is designed for understanding of student about the

	Objectives	various principles involve in food preservation. 2. This course demonstrates technology and various industrial processes which involved in food preservation
6	Course Outcomes	After successfully completion of this course students will be able to: CO1. Understand the principles and methods of food preservation, Thermal processing equipment and calculate adequacy of heat treatment. CO2. Demonstrate the principles, technology, industrial methods and application of preservation by low temperature. CO3. Understand the principles, technology, industrial methods and application of preservation by moisture removal. CO4. Understand the principles, technology, industrial methods and application of preservation by irradiation and membrane technology. CO5. Understand the uses and effects of chemical preservatives in food Industry with principle, mechanism and application of various novel techniques in food preservation. CO6. Understand the various conventional and novel food preservation techniques.
7	Course Description	Food preservation is an important part of food industry. Principles of food preservation describe various principles to be followed for food preservation. This course covers various methods like high temperature treatment, low temperature treatment, drying/dehydration, chemical preservation and novel techniques.
8	Outline syllabus	CO Mapping
	Unit 1	Principles of Preservation
	A	Scope and importance of food processing, Historical developments in food processing. `Types of foods and causes of food spoilage
	B	Principles and methods of preservation. Heat preservation and processing, heat resistance of microorganisms, thermal death curve, D,F and Z value, types of heat treatments and effects on foods
	C	Canning of foods, cans and container types, spoilage of canned foods, heat penetration
	Unit 2	Cold preservation
	A	Cold preservation and processing. Requirement of refrigeration and Freezing, Difference between refrigeration and freezing
	B	Effect of low temperature on fresh food, storage changes in food during refrigerated storage. Freezing and frozen storage, Slow and quick freezing
	C	Freezing curves, Freezing methods, factors determining freezing rate, changes in food during freezing, Frozen food storage
	Unit 3	Moisture reduction in Preservation

	A	Drying, Dehydration and concentration, Sun drying and solar dehydration, Drying methods Drying curves, and type of dryers			CO3, CO6
	B	Food concentration, Methods of concentration of fruit juices, Liquid food concentrates, Changes in food during dehydration and concentration			
	C	Water activity; Role of water activity in food preservation, Intermediate moisture foods (IMF), Principles, characteristics, advantages and problems of IM foods			
	Unit 4	Irradiation			
	A	Food Irradiation, Use of ionization radiations in food preservation, Sources, Units, effects, limitations, dose determination, safety and wholesomeness of irradiated foods			CO4,CO6
	B	Food irradiation techniques and recent applications of irradiation in food preservation			
	C	Chemical Preservation, Uses and effects of class I and class II preservatives in foods, membrane technology			
	Unit 5	Novel Techniques in Food Preservation			
	A	Hydrostatic pressure			CO5, CO6
	B	Dielectric heating, microwave processing,			
	C	Hurdle technology- Properties, mechanism of heating, Application of in food processing and its effects on nutrients.			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Norman, N.P and Joseph, H.H.(1997). Food Science, Fifth edition, CBS Publication, New Delhi			
	Other References	1. Frazier, W. and Westhoff, D. (2014). <i>Food Microbiology</i> . 5th ed. New Delhi: McGraw Hill Education (India) Private Limited			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Food Enzymology: BFS208

School: SBSR		Batch : 2018-2021
Program: B. Sc		Current Academic Year: 2019-20
Branch: Food Science and Technology		Semester: 4
1	Course Code	BFS 208
2	Course Title	Food Enzymology
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objective	1. To introduce the Food Enzymology and its industrial application. 2. To develop the knowledge of Food Enzymes. 3. To set up appropriate examples for enzymes used as chemistry in terms of food product development. 4.To develop the knowledge of chemistry behind enzymes
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Comprehend the basic chemistry concept of enzymes and their role. CO2: Develop idea for chemistry of enzymes action on food. CO3: Different parameters use to evaluate enzyme activity in carbohydrates, proteins and fat. CO4: Various enzymes and their role in food. Enzymes as Additives. Differentiation among enzymes and enzyme activity. CO5: Recognize the importance and utility of Food enzyme chemistry in food. Basic understanding chemistry with food. CO6: Food enzymes used in food preservation and chemicals
7	Course Description	Food Enzymology is an application of various enzymes found in food and their end use in new product development. The types of molecules from plant after fermentation introduce beneficial as additives in food preservation. In the future Food Enzymology could offer foods with higher vitamin levels, longer shelf lives or the ability to retain as fresh even in the face of climate change. In this course, students will learn about the different bimolecular and techniques/

		methods used as ingredients/material and their use.			
8	Outline syllabus				CO Mapping
	Unit 1	Enzymes			CO1,
	A	Introduction, Definition and functions			CO1, CO6
	B	characterization, kinetics and immobilization; fermentative production of enzymes (amylases, proteases, cellulases, pectinases, xylanases, lipases)			CO1,
	C	Enzymes used in food industry and their downstream processing.			CO1
	Unit 2	Enzymes in processing of food			CO2,
	A	Role of enzymes in baking (fungal α -amylase for bread making; maltogenic α -amylases for anti-staling; xylanases and pentosanases as dough conditioners			CO2
	B	lipases or dough conditioning; oxidases as replacers of chemical oxidants; synergistic effect of enzymes);			CO2
	C	Enzymes in meat processing (meat tenderization) and egg processing.			CO2
	Unit 3	Role of enzymes in fruit juices			CO3
	A	Liquefaction, clarification, peeling, de bittering, decolourization			CO3
	B	Enzymes in brewing: Enzymes in malting and mashing, Enzymes for process improvement, starch- haze removal			CO3
	C	Applications of enzymes: protein cross-linking and oil degumming enzymatic approach to tailor- made fats.			CO3
	Unit 4	Enzyme processing for flavours			CO4
	A	Enzyme-aided extraction of plant materials for production of flavours			CO4
	B	Production of flavour enhancers such as nucleotides; flavours from hydrolyzed animal/vegetable protein			CO4
	C	Role of enzymes in cheese making, whey processing.			CO4
	Unit 5	Other applications			CO5, CO6
	A	Enzymes for production of protein hydrolysates and bioactive peptides			CO5
	B	Enzyme safety and regulations			CO5
	C	Regulations of enzyme products			CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1) A Wiley- Inter Science Publ. Kruger JE. et al. 1987. Enzymes and their Role in Cereal Technology. American Association of Cereal Chemists Inc. 2) Nagodawithana T & Reed G. 1993. Enzymes in Food Processing. Academic Press.			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Food Preservation Lab: BFP 205

School: SBSR		Batch : 2018-2021
Program: B.Sc.		Current Academic Year: 2019-20
Branch: Food Science and Technology		Semester: 4
1	Course Code	BFP205
2	Course Title	Food Preservation Lab
3	Credits	2
4	Contact Hours (L-T-P)	0-0-3
	Course Status	Compulsory
5	Course Objectives	1. The course is designed for understanding of student about the various principles involve in food preservation. 2. This course demonstrates technology and various industrial processes which involved in food preservation
6	Course Outcomes	After successfully completion of this course students will be able to: CO1. Understand the principles and methods of food preservation, Thermal processing equipment and calculate adequacy of heat treatment. CO2. Demonstrate the principles, technology, industrial methods and application of preservation by low temperature. CO3. Understand the principles, technology, industrial methods and application of preservation by moisture removal. CO4. Understand the principles, technology, industrial methods and application of preservation by irradiation and membrane technology. CO5. Understand the uses and effects of chemical preservatives in food Industry with principle, mechanism and application of various Novel techniques in food preservation.

		CO6. Understand the various conventional and novel food preservation techniques.			
7	Course Description	Food preservation is an important part of food industry. Principles of food preservation describe various principles to be followed for food preservation. This course covers various methods like high temperature treatment, low temperature treatment, drying/dehydration, chemical preservation and novel techniques.			
8	Outline syllabus				CO Mapping
	Unit 1	Principles of Preservation			
	A	Scope and importance of food processing, Types of foods and causes of food spoilage			CO1, CO6
	B	Heat preservation and processing			
	C	Canning of foods			
	Unit 2	Cold preservation			
	A	Cold preservation and processing			CO2, CO6
	B	Effect of low temperature on fresh food			
	C	Freezing curves, Freezing methods			
	Unit 3	Moisture reduction in Preservation			
	A	Drying methods and type of dryers			CO3, CO6
	B	Food concentration, Methods of concentration of fruit juices, Liquid food concentrates			
	C	Water activity; Role of water activity in food preservation, Intermediate moisture foods (IMF)			
	Unit 4	Irradiation			
	A	Food Irradiation, Use of ionization radiations in food preservation			CO4,CO6
	B	Food irradiation techniques and recent applications of irradiation in food preservation			
	C	Chemical Preservation, Uses and effects of class I and class II preservatives in foods			
	Unit 5	Novel Techniques in Food Preservation			
	A	Hydrostatic pressure			CO5, CO6
	B	Dielectric heating, microwave processing,			
	C	Hurdle technology- Properties, mechanism of heating, Application in food processing and effects on nutrients.			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	2. Norman, N.P and Joseph, H.H. (1997). Food Science, Fifth edition, CBS Publication, New Delhi			
	Other References	2. Frazier, W. and Westhoff, D. (2014). <i>Food Microbiology</i> . 5th ed. New Delhi: McGraw Hill Education (India) Private Limited			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Processing Technology of Cereals, Pulses and Oilseeds Lab: BFP206

School: SBSR		Batch : 2018-2021
Program: B.Sc		Current Academic Year: 2019-20
Branch: Food Science and technology(H)		Semester: 04
1	Course Code	BFP206
2	Course Title	Processing Technology of Cereals, Pulses and Oilseeds Lab
3	Credits	2
4	Contact Hours (L-T-P)	0-0-3
	Course Status	Compulsory
5	Course Objective	To develop the knowledge of structure, processing and importance of major cereals, legumes and oilseed crops
6	Course Outcomes	<p>After successfully completion of this course students will be able to:</p> <p>CO1: Students will be to understand the structural nutritional and processing importance of wheat grain.</p> <p>CO2: Students will be able to understand the physico-chemical properties of rice grain and importance of parboiling based on its advantages and disadvantages.</p> <p>CO3: To enable the students to gather an overview of other important cereals and their processing aspects</p> <p>CO4: Students will be able to describe about processing of various pulses</p> <p>CO5: Students will be able to have overall idea of oilseeds and processing of vegetable oils and fats.</p> <p>CO6: Students will be able to have overall the importance of major cereals, legumes and oilseed crops</p>
7	Course	Cereals, legumes and oilseeds are important source of food and feed in

	Description	human life. Therefore overall of these aspects are important to facilitate their better utilization.			
8	Syllabus outline				CO Mapping
	Unit 1	Importance of testing procedures for cereal and related products			CO1, CO6
	A	Determination of water/oil absorption properties of cereals and legumes.			
	B	Determination of swelling power of cereals and legumes.			
	C	Determination of solubility index of cereals and legumes.			
	Unit 2	Identify adulteration in cereals grains and legumes			CO2, CO6
	A	Detection of <i>kesari</i> dal powder (<i>Lathyrus sativus</i>) in <i>Besan</i> .			
	B	Determination of foreign matter in food grains.			
	C	Detection of starch adulterant in the food sample			
	Unit 3	Determination of acid and saponification value of oilseeds			CO3, CO6
	A	Determination of saponification value of oilseeds			
	B	Determination of acid value in mustard oil.			
	C	Determination of saponification value in butter.			
	Unit 4	Dehulling and milling of cereals and legumes			CO4, CO6
	A	Principles and methods of dehulling			
	B	Dal milling process and visit to dal mill industry			
	C	De-husking of rice/millet/major cereals			
	Unit 5	Production of cereal and legumes based food products			CO5; CO6
		Production of fermented products from cereals/legumes			
		Production of soymilk			
		Production of soy tofu			
	Mode of examination				
	Weight age Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	1) Chakraverty, A. 1988. Postharvest Technology of Cereals, Pulses and oilseeds. Oxford and IBH, New Delhi. 2) Kent, N.L. 1983. Technology of Cereals. 3rd Edn. Pergamon Press, Oxford, UK. 3) Salunkhe, D. and Deshpande, S.S (2001) Foods of Plant origin : Production, Technology & Human 4) Nutrition An AVI Publications, New York. Pomeranz, Y. 1987. Modern Cereal Science and Technology. VCH Pub., New York.			
	Other References				

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Technology of Fruits and Vegetables: BFS301

School: SBSR		Batch : 2018-2021
Program: B.Sc.		Current Academic Year: 2019-20
Branch: Food Science and Technology		Semester: 5
1	Course Code	BFS301
2	Course Title	Technology of Fruits and Vegetables
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objectives	1. To train the students for Fruit and Vegetable Processing industry. 2. To develop knowledge for the fruits and vegetables canning industry. 3. To acquaint students with various spoilage associated with fruits and vegetables canning.
6	Course Outcomes	After successfully completion of this course students will be able to: CO1. Understand the importance, canning and need of preservation for fruits and vegetables. CO2. Understand the processing and preservation of fruit juices. CO3. Understand the industrial method of making Jam , jellies and marmalades. CO4. Understand the making of pickles, chutneys, sauces with processing of tomatoes and their various products. CO5. Understand the drying and dehydration methods of fruits and vegetables. CO6. Understand the processing technology of fruits and vegetables
7	Course Description	Fruits and vegetables products are important part of our daily diet like jam, jelly, marmalades, ketchup and sauces etc. Technology of fruits and

		vegetables processing provides knowledge about various products manufacturing which can enhance the entrepreneurship for small scale or even large scale production of fruits and vegetables products.		
8	Outline syllabus			CO Mapping
	Unit 1	Introduction		CO1, CO6
	A	Importance of fruits and vegetable ;history and need of preservation ;Reasons of spoilage		CO1, CO6
	B	Method of preservation ; Canning and bottling of fruits and vegetables ;process of canning; factors affecting the process- time and temperature		CO1, CO6
	C	Lacquering syrups and brines for canning; spoilage in canned foods, containers of packing.		CO1, CO6
	Unit 2	Fruit Beverages and products		CO2, CO6
	A	Processing of fruit juices		CO2, CO6
	B	Preservation of fruit juices (pasteurization ,chemically preserved with sugars, freezing ,drying ,tetra packing , carbonation)		CO2, CO6
	C	Processing of squashes, cordials, nectors, concentrates and powder		CO2, CO6
	Unit 3	Jams, jellies and marmalades		CO3, CO6
	A	Jam: Constituents, selection of fruits, processing & technology		CO3, CO6
	B	Jelly: Essential constituents (Role of pectin, ratio);Theory of jelly formation, Processing; defects in jelly		CO3, CO6
	C	Marmalade: Types, processing & technology, defects.		CO3, CO6
	Unit 4	Pickles, chutneys and sauces		CO4, CO6
	A	Processing and types of pickles and chutney; causes of spoilage		CO4, CO6
	B	Tomato products: Selection of tomatoes, pulping		CO4, CO6
	C	Processing of tomato juice; tomato puree; paste ketchup; sauce and soup		CO4, CO6
	Unit 5	Dehydration of foods and vegetables		CO5,CO6
	A	Sun drying &mechanical dehydration		CO5,CO6
	B	Process variation for fruits and vegetables		CO5,CO6
	C	Effects of dehydration on fruits and vegetables (Merits/Demerits); packing and storage.		CO5,CO6
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1.Girdharilal, Siddappaa, G.S and Tandon, G.L., Preservation of fruits & Vegetables, ICAR, New Delhi, 1998		
	Other References	1. Manay, S. & Shadaksharaswami, M., Foods: Facts and Principles, New Age Publishers, 2004		

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Technology of Spices and Plantation Crops: BFS302

School: SBSR		Batch : 2018-2021
Program: B.Sc		Current Academic Year: 2020-21
Branch: Food Science and technology		Semester: 5
1	Course Code	BFS302
2	Course Title	Technology of Spices and Plantation Crops
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objective	The course will cover study of the types of spices, their origin, functions and processing techniques. Introduction to functional foods and their characteristics, recent advances in sugar based products and processing of miscellaneous foods.
6	Course Outcomes	Upon completion of this course, students are expected to be able to: CO1. Recognize and describe the processing conditions of spices CO2. Analyze the role and significance of nutraceuticals CO3. Describe processing of sugar based products CO4. Utilize laboratory techniques to detect, quantify, and identify adulterations in spices CO5 Describe the manufacturing of Tea, Coffee and Chocolate. CO6. Discover, and apply the theories of spices in practical, real-world situations and problems.
7	Course Description	This course has been designed to make student understand the processing technology used for manufacturing of Spices and Plantation crops and the

		role of them in nutraceuticals.			
8	Outline syllabus				CO Mapping
	Unit 1	SPICES			
	A	Classification of spices ; Method of manufacture of spices			CO1,CO4,CO6
	B	Processing and properties of major and minor spices, Essential oils & oleoresins			
	C	Different adulterations in spices, Uses of spices, fumigation and irradiation of spices.			
	Unit 2	Tea-Coffee and Cocoa			
	A	Coffee: Occurrence, chemical constituents; harvesting, fermentation of coffee beans; changes taking place during fermentation; drying; roasting;;			CO5
	B	Process flow sheet for the manufacture of coffee powder; instant coffee technology; chicory chemistry; quality grading of coffee			
	C	Cocoa: Occurrence, chemistry of the cocoa bean; changes taking place during fermentation of cocoa bean; processing of cocoa bean. chocolates– types, chemistry and technology of chocolate manufacture; quality control of chocolates.			
	Unit 3	TEA			
	A	Tea: Occurrence, chemistry of constituents; harvesting; types of tea – green, oolong and CTC; Chemistry and technology of CTC tea			CO5,CO6
	B	Manufacturing process for green tea, black tea manufacture and instant tea.			
	C	Quality evaluation and grading of tea			
	Unit 4	Functional foods			
	A	Different functional foods and their sources along with benefits; Introduction to nutraceuticals: definitions, basis of claims for a compound as a nutraceutical.			CO2,CO6
	B	Manufacturing aspects of selected nutraceuticals such as lycopene, isoflavonoids ; regulatory issues for nutraceuticals including CODEX.			
	C	Formulation of functional foods containing nutraceuticals – stability and analytical issues, Clinical testing and labeling issues of nutraceuticals and health foods.			
	Unit 5	Technology of miscellaneous food products			
	A	Gelatin Dishes -Types available and uses ; Principles of sugar cookery, Crystalline and non-crystalline candies.			CO3,CO6
	B	Uses of sugars; Different types of sugar (sugar, Jaggery, honey, syrup), Manufacture, selection, storage.			
	C	Health risks like dental caries, obesity etc.			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Manay, N.S, Shadaksharaswamy, M., Foods- Facts and Principles. New Age International Publishers.. New Delhi..			

		2004.	
	Other References	2. Srilakshmi, B. Food Science (3rd edition), New Age International (P) Limited 3. Potter, N.N. Food Science (5th edition), CBS publishers and Distributors, New Delhi.	
		4. Prescott and Proctor B.E. Food Technology. MC Graw hill Book Co. New York 1997. 5. Kent, J.A. Riegels Handbook of Industrial Chemistry, 7th edition. Van Nostrand Reinhold 6. Minifie BW. 1999. Chocolate, Cocoa and Confectionery Technology. 3rd Ed. Aspen Pub 7. Banerjee B. 2002. Tea Production and Processing. Oxford Univ. Press.	

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Food Packaging: BFS 303

School: SBSR		Batch : 2018-2021
Program: B. Sc		Current Academic Year: 2020-21
Branch: Food Science and Technology		Semester: 5
1	Course Code	BFS303
2	Course Title	Food Packaging
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objective	1. Understanding about food packaging. 2. Importance and need of packaging in the industrial use. 3. Various packaging materials, available for food Products. 4. Types of plastics, methodology and technologies involved in

		packaging. 5. Industrial use and ways for packaging material. 6.Food labeling and packaging 7.Codex Guidelines	
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Comprehend the basic concept of food and packaging. CO2: Food packaging methods. Recognize the importance and utility packaging material used in food Industry CO3: Treatment and testing of physical, chemical and biological methods applied on packaging materials. Various hazards and their control measures during food packaging. CO4: Types, availability and utilization of packaging material for food processing Industries. CO5: Status and utilization of Industrial Use.	
7	Course Description	Food packaging is an application for food processing. The types of treatment applied during processing identification are beneficial as by product self-life enhancement. In the future packaging field could offer more depth knowledge with its applicable techniques. In this course, students will learn about the different materials required in food manufacturing	
8	Outline syllabus		CO Mapping
	Unit 1	INTRODUCTION	CO1,
	A	Introduction to food packaging	CO1,
	B	Types of food processing industries & their present methods of shelf life enhancement in packaging.	CO1, CO2
	C	Identification of different packaging materials.	CO1
	Unit 2	Materials for food packaging, types, uses, merits and drawbacks	CO2, CO3
	A	Properties for packing materials	CO2
	B	Food packages -Paper, bags ,pouches ,wrappers, Tin, Aluminum, Plastic, Boxes, Jars;	CO2
	B	Food packages -Paper, bags ,pouches ,wrappers, Tin, Aluminum, Plastic, Boxes, Jars;	CO2
	C	Tetra packs, aerosol containers	CO2
	Unit 3	Modern concepts of packaging technology	CO3
	A	Physical test for tin and plastic	CO3
	B	Testing of glass containers	CO3
	C	Physical and chemical test for plastics	CO3
	Unit 4	Quality Testing Of Packaging Materials	CO4
	A	Weighing, filling, scaling, wrapping, cartooning, labeling, marking and trapping;	CO4
	B	Physical and chemical test for plastics	CO4
	C	Shelf life testing of tin, plastic, Oxygen interactions, moisture interchanges and aroma permeability.	CO4
	Unit 5	Packaging of finished goods	CO5

	A	Weighing, filling, scaling, wrapping, cartooning,			CO5
	B	labeling, marking and trapping; Labeling : Standards, purpose,			CO5
	C	labeling regulation barcode; Nutrition labeling, health claims, and mandatory labeling provision.			CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	Food Packaging Technology by Richard Coles ; © 2003 by Blackwell Publishing Ltd			
	Other References	Crosby NT.1981. Food Packaging: Aspects of Analysis and Migration Contaminants. App. Sci. Publ.			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Food Engineering: BFS304

School: SBSR		Batch : 2018-2021
Program: B.Sc.		Current Academic Year: 2020-21
Branch: Food Science and Technology		Semester: 5
1	Course Code	BFS304
2	Course Title	Food Engineering
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objectives	1. To allow students to familiarize themselves with the food engineering for handling of various food materials during processing.

		2. To develop the expertise for various mathematical models used in food industry.
6	Course Outcomes	<p>After successfully completion of this course students will be able to:</p> <p>CO1. Design the plant layout.</p> <p>CO2. Calculate the various engineering units and engineering properties of foods.</p> <p>CO3. Design and understand the liquid transport system according to flow behavior of food.</p> <p>CO4. Calculate and understand the conservation of mass, law of thermodynamics and energy balance of the system.</p> <p>CO5. Understand the steam generation system, fuel utilization system and various laws for electrical energy.</p> <p>CO6. Understand the engineering approach in food industry.</p>
7	Course Description	Food Engineering provides the vast knowledge about engineering calculations related to food industry. For developing any machinery for food industry, one should have knowledge for engineering terms. Workings in food industry also require the knowledge about design of heat exchangers, fluid mechanics and thermodynamics.
8	Outline syllabus	
	Unit 1	Design and Layout of food plant
	A	Design and layout of food plants
	B	Important considerations for designing of food plants; Construction and design
	C	Types of layout
	Unit 2	Units and Dimensions
	A	Dimensions – Primary and Secondary ; Engineering Units – Base Units, Derived Units and supplementary Units
	B	System – State of a system, extensive and intensive properties
	C	Density – Solid, Particle and Bulk density; Phase diagram of water
	Unit 3	Fluid flow in food processing
	A	Liquid Transport Systems – Pipes and Pumps; PUMPS- Definition, classification, positive displacement and centrifugal pumps, factors affecting choice of a pump
	B	Properties of liquids - Density, Pressure, Surface tension and Viscosity ; laminar and turbulent fluid
	C	The Continuity equation; Reynold's number
	Unit 4	Thermodynamics and equilibrium
	A	Conservation of mass- conservation of mass for an open system and a closed system
	B	Thermodynamics – laws of thermodynamics ,
		CO Mapping
		CO1, CO6
		CO1, CO6
		CO1, CO6
		CO1, CO6
		CO2, CO6
		CO2, CO6
		CO2, CO6
		CO2, CO6
		CO3, CO6
		CO3, CO6
		CO3, CO6
		CO3, CO6
		CO4, CO6
		CO4, CO6
		CO4, CO6

		Equation of state and Perfect Gas Law			
	C	Energy – potential and kinetic energy, Energy balance for a closed system and an open system, total energy balance			CO4, CO6
	Unit 5	Energy in Unit processes			CO5, CO6
	A	Generation of steam – Steam Generation System, Steam Tables, Steam Utilization			CO5, CO6
	B	Fuel utilization –Systems ,Mass and energy balance analysis ,Burner efficiency; Electric Power Utilization – Electric Terms and Units,			CO5, CO6
	C	Ohm’s Law, Electric Circuits, Electric Motors, Electric Controls and Lighting.			CO5, CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Heldman, D.R. and Lund, D.B. Handbook of Food Engineering 2nd edition. CRC press, Newyork, 2007.			
	Other References	1. Singh, R.P. Introduction to Food Engineering 3rd edition. Academic Press, London. 2004			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Technology of Fruits and Vegetables Lab: BFP301

School: SBSR	Batch: 2018-2021
Program: B. Sc	Current Academic Year: 2020-21
Branch: Food Science and Technology	Semester: 5
1	Course Code BFP301
2	Course Title Technology of Fruits and Vegetables Lab

3	Credits	2
4	Contact Hours (L-T-P)	0-0-3
	Course Status	Compulsory
5	Course Objective	<ul style="list-style-type: none">• To identify the basic techniques of food preparation for increasing the shelf life of fruits and vegetables.• To analyze the use of chemical preservatives in food.• Identify the impact of certain technological operations and parameters on the success of fruit and vegetable processing and on certain properties of final product.• To develop a knowledge of new product development and waste reduction.
6	Course Outcomes	After finishing the course the students will be able to: CO1: Demonstrate common post-harvest management and grading techniques. . CO2: Explain the importance of various chemicals preservatives in preservation. CO3: Understand basic techniques used in the estimation of lycopene . CO4: Recognize the importance of microbiological analysis in fruits and vegetables. CO5: Identify the importance of the chemical composition of different varieties of fruits and vegetables intended for processing and processing conditions to the composition and properties of the product.
7	Course Description	The course will introduce students to methods used in preparation, preservation and microbiological examination of fruits and vegetable based processed foods. Students will be exposed to practical training on preparation, and analysis of increased shelf life by using preservatives.
8	Outline syllabus	
	Unit 1	Practical based on post-harvest management and grading of foods.
	A	General Laboratory Practices
	B	Principle of commonly equipment's used in food processing
	C	Commonly used steps in post-harvest management and grading of foods
	Unit 2	Practical related to preservation of fruits by different methods.
	A	Preservation using osmotic dehydration
	B	Preservation using low temperature
	C	Preservation using high temperature
	Unit 3	Practical related to estimation of lycopene.
	A	Preparation of solution used for estimation of lycopene content
	B	Estimation of lycopene in tomato
	C	Estimation of lycopene in any fruit sample other

		than tomato	
	Unit 4	Practical related to oxidative rancidity.	CO2,CO6
	A	Estimation of oxidative rancidity in cooking oil	
	B	Estimation of oxidative rancidity in nuts	
	C	Estimation of oxidative rancidity in seeds s	
	Unit 5	Practical related to development of value added new product.	CO1,CO3,C04,CO6
	A	Development of Mixed fruit Jam	
	B	Development of fruit/vegetables fortified cereal product	
	C	Development of Mixed fruit Juice	
	Mode of examination		
	Weight age Distribution	CA 60%	MTE 0% ETE 40%
	Text book/s*	Laboratory Manual in Food Preservation by Marion L. Fields, Avi Publishing Co Inc.; New edition edition (December 1983)	

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Technology of Spices and Functional Foods Lab: BFP302

School: SBSR		Batch: 2018-2021
Program: B.Sc.		Current Academic Year: 2020-21
Branch: Food Science and Technology		Semester:5
1	Course Code	BFP302
2	Course Title	Technology of Spices and Functional Foods Lab
3	Credits	2
4	Contact Hours (L-T-P)	0-0-3

	Course Status	Compulsory		
5	Course Objective	<ul style="list-style-type: none"> To develop a knowledge about spices and functional foods. To develop knowledge of spice adulteration. 		
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Identify the chemical composition of spices. CO2: Extract the volatile components of spices. CO3: Prepare the probiotic drink/food. CO4: Prepare the functional foods. CO5: Identify the adulteration in spices. CO6: Understand the practical approach of spices and functional foods.		
7	Course Description	In this course, students will learn about chemistry of spices, health benefits of functional foods, volatile components of spices and adulteration of spices.		
8	Outline syllabus	CO Mapping		
	Unit 1	Practical related to chemical analysis of spices		CO1, CO6
	A	Estimation of moisture content in spice		
	B	Estimation of total phenolic content in spices		
	C	Estimation of CHO content in spices		
	Unit 2	Practical related to extraction of volatile components of spices.		CO2, CO6
	A	Extraction of volatile components of spices 1.		
	B	Extraction of volatile components of spices 2.		
	C	Extraction of volatile components of spices 3.		
	Unit 3	Practical related to preparation of probiotic drink/food.		CO3, CO6
	A	Preparation of probiotic drink		
	B	Preparation of probiotic food.		
	C	Preparation of probiotic products		
	Unit 4	Practical related to preparation functional foods.		CO4, CO6
	A	Development of functional food – 1		
	B	Development of functional food – 2		
	C	Development of functional food – 3		
	Unit 5	Practical related to adulteration of spices.		CO5, CO6
		Detection of adulterant in spice-1		
		Detection of adulterant in spice-1		
		Detection of adulterant in spice-1		
	Mode of examination	Practical and Viva		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	1.Manay, N.S, Shadaksharaswamy, M., Foods- Facts and Principles., New Age International Publishers., New Delhi., 2004		
	Other			

References	
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Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

DAIRY TECHNOLOGY: BFS305

School: Basic Sciences & Research		Batch : 2018-2021
Program: B. Sc.		Current Academic Year: 2020-21
Branch: Food Science and Technology		Semester:6
1	Course Code	BFS305
2	Course Title	Dairy Technology
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objective	The course is designed to equip students with a broad understanding of dairy chemistry and processing involved in manufacturing of dairy based products. The course provides a foundation for careers in new product development, dairy industry and quality control laboratories.
6	Course Outcomes	After the successful completion of this course students will be able to: CO1.Discuss milk and its nutritional value. CO2 Provide an overview of the major macro and micronutrients relevant to human health available in milk. CO3. Explain the importance of processing and cleaning CO4 Review potential applications and efficiency of various equipment's used in dairy products processing. CO5 Apply Total Quality Management Systems into processes. CO6 Understand processing conditions for different dairy products.

7	Course Description	Dairy Technology is a course which focuses on dairy products and is a part of the food technology and processing industry. Students pursuing dairy technology learn about milk processing as well the manufacturing process for its by-products. The study includes quality control at the time of processing of products. The course helps in gaining technical knowledge about dairy processing equipment.		
8	Outline syllabus			CO Mapping
	Unit 1	Technology of milk and dairy products		
	A	Milk composition and processing		
	B	In plant cleaning system		
	C	Total quality management		
	Unit 2	Manufacturing of dairy products		
	A	Condensed, evaporated and powdered milk		
	B	Cheese, Ice-cream, Butter and Ghee		
	C	Malting products		
	Unit 3	Substitutes for milk and milk products		
	A	Casein and caseinates; Lactose		
	B	Whey protein concentrates and isolates		
	C	Milk co precipitates, and other by-products		
	Unit 4	Fortification and enrichment		
	A	Therapeutic Foods		
	B	Technology of baby foods		
	C	Fortification and enrichment of milk products		
	Unit 5	Manufacturing of dairy products		
	A	Yoghurt, Dahi, and srikhand		
	B	Khoa, Burfi, Kalakand		
	C	Gulabjamun, Rosogolla, Channa , Paneer		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Dey, S. 1994. Outlines of Dairy Technology. Oxford Univ. Press, New Delhi.		
	Other References	2. Walstra et al. 2006. Dairy Science and Technology. 2 nd Ed. Taylor & Francis. 3. Aneja <i>et al.</i> 2002. Technology of Indian Milk Products. Dairy India Publ. 3.Total Quality Management in Indian Dairy Industry (A Comparative Study on Select Units in Dairy Industry) G. Malathi*, Dr. R. Siva Ram Prasad**		

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Technology of Meat, Poultry and Sea Foods: BFS306

School: SBSR		Batch : 2018-2021
Program: B.Sc		Current Academic Year: 2020-21
Branch: Food Science and Technology		Semester: 6
1	Course Code	BFS-306
2	Course Title	Technology of Meat, Poultry and Sea Foods
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objective	This course shall educate students about the importance of meat and poultry industry in nation's economy. The students shall gain knowledge of the processing and preservation of meat, poultry and seafoods.
6	Course Outcomes	After successful completion of this course, students will be able to: CO1: Understand the current scenario of meat and poultry industry in India. CO2: Learn the glossary of live market terms for animals and birds. CO3: Understand the processing of meat, poultry and seafoods. CO4: Grasp knowledge of factors affecting meat quality and different preservation techniques. CO5: Value-addition to poultry and fish by-products. CO6: To learn the overall objective of meat Industry.
7	Course Description	This course has been designed to make student understand the processing and preservation technology for meat, poultry and seafoods.

8	Outline syllabus		CO Mapping
	Unit 1	Introduction	
	A	Livestock and poultry population in India	CO1, CO6
	B	Development of meat and poultry industry in India and its need in nation's economy	
	C	Glossary of live market terms for animals and birds	
	Unit 2	Meat preservation and quality	
	A	Effects of feed, breed and environment on production of meat animals and their quality	CO3, CO4
	B	Meat Quality-color, flavor, texture, Water-Holding Capacity(WHC)	
	C	Preservation of meat: Refrigeration and freezing, thermal processing- canning of meat, retort pouch, dehydration, irradiation, and RTE meat products, meat curing	
	Unit 3	Slaughtering and Carcass Processing	
	A	Modern abattoirs, typical layout and features, Ante-mortem handling and design of handling facilities	CO3, CO4
	B	Hoisting rail and traveling pulley system; stunning methods; steps in slaughtering and dressing; offal handling and inspection	
	C	operational factors affecting meat quality; effects of processing on meat tenderization; abattoir equipment and utilities	
	Unit 4	Processing of Poultry Products	
	A	Poultry industry in India; measuring the yields and quality characteristics of poultry products, microbiology of poultry meat, spoilage factors; Lay-out and design of poultry processing plants, Plant sanitation	CO3, CO5
	B	Poultry meat processing operations, equipment used-Defeathering, bleeding, scalding etc.; Packaging of poultry products, refrigerated storage of poultry meat	
	C	By products- eggs, egg products, Whole egg powder, Egg yolk products, their manufacture, packaging and storage.	
	Unit 5	Fish and other Marine Products Processing	
	A	Commercially important marine products from India; product export and its sustenance; basic biochemistry and microbiology	CO5, CO6,
	B	Preservation of postharvest fish freshness; transportation in refrigerated vehicles; deodorization of transport systems; design of refrigerated and insulated trucks; grading and preservation of shell fish	
	C	Pickling and preparation of fish protein concentrate, fish oil and other by-products.	
	Mode of examination	Theory	

	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Norman, N.P and Joseph, H.H.(1997). Food Science,Fifth edition, CBS Publication, New Delhi. 2. Lawrie, R. A. (1998). <i>Lawrie's Meat Science</i> (6 th ed.): Woodhead, Cambridge.			
	Other References	1. Kerry, J., Kerry, J. &Ledward, D. (2002). <i>Meat Processing Improving Quality</i> : CRC Press, USA. 2. Hui, Y. H. (2010). Handbook of Poultry Science and Technology 3. Fernandes, R. (2009). Fish and Seafood.			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Food Safety and Regulations: BFS307

School: SBSR		Batch : 2018-2021
Program: B.Sc.		Current Academic Year: 2020-21
Branch: Food Science and Technology		Semester: 6
1	Course Code	BFS307
2	Course Title	Food Safety and Regulations
3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objectives	1. To develop knowledge for food safety and quality assurance. 2. To acquaint students with various national and international laws associated with safety. 3. To train students for food industry.
6	Course Outcomes	After successfully completion of this course students will be able to: CO1. Understand general principles of food safety and hygiene.

		CO2. Apply the food safety regulations. CO3. Recognize the national food laws. CO4. Understand the role of international bodied dealing in standardization. CO5. Recognize current concerns for food safety. CO6. Prepare for working in food industry and other food laws governing bodies.	
7	Course Description	Food Safety is a scientific discipline describing handling, preparation and storage of food in ways that prevent foodborne illness. This includes a number of routines that should be followed to avoid potential severe health hazard. In all countries, food is governed by a complexity of laws and regulations which set out the government’s requirements to be met by food chain operators to ensure the food is safe and of adequate quality. Generally “food law” is used to apply to legislation which regulates the production, trade and handling of food and hence covers the regulation of food control, food safety and relevant aspects of food trade. Minimum quality requirements are included in the food law to ensure the foods produced are unadulterated and are not subjected to any fraudulent practices intended to deceive the consumer.	
8	Outline syllabus		CO Mapping
	Unit 1	General Principles for Food Safety and Hygiene	CO1,CO6
	A	Principles of food safety and quality -Food Safety-system - Quality attributes - Management	CO1,CO6
	B	Introduction to Risk Analysis, Risk Management, Risk Assessment, Risk communication, CCP	CO1,CO6
	C	Principles and implementation or HACCP. Traceability and authentication, Certification and quality assurance	CO1,CO6
	Unit 2	General principles for Food Safety Regulation	CO2,CO6
	A	The Structure of Food-Law, Food Regulation	CO2,CO6
	B	Laws and Regulations to prevent Adulteration and cross contamination, Microbial contamination	CO2,CO6
	C	Hygienic practice, chemical and Environmental Contamination, Food Additives, Labelling.	CO2,CO6
	Unit 3	National Standards	CO3,CO6
	A	PFA, FPO, MMPO, MPO, AGMARK, BIS	CO3,CO6
	B	Environment and Pollution Control Board, Trends in Food Standardization	CO3,CO6
	C	An overview and structure of 9001 :2000/2008, clause wise Interpretation of ISO 9001:2000, An overview and Structure of 22000:2005	CO3,CO6
	Unit 4	International Bodies Dealing in Standardization	CO4, ,CO6
	A	International Standardization organization (ISO), Joint FAO/WHO Food Standards program	CO4,CO6

	B	Codex Alimentarius commission (CAC)	CO4,CO6
	C	Other International organizations Active in Food Standard Harmonization. Advantages of Utilizing International Standards.	CO4,CO6
	Unit 5	Recent Concerns	CO5,CO6
	A	Packaging	CO5, ,CO6
	B	Product labelling and Nutritional labelling, organic foods	CO5, ,CO6
	C	Newer approaches to food safety	CO5, ,CO6
	Mode of examination	Theory	
	Weightage Distribution	CA 30%	MTE 20%
			ETE 50%
	Text book/s*	1. De Vries. Food Safety and Toxicity, CRC, New York, 1997	
	Other References	1.Manay, S. & Shadaksharaswami, M., Foods: Facts and Principles, New Age Publishers, 2004	

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Waste Management in Food Industries: BFS308

School: SBSR	Batch : 2018-2021
Program: B. Sc	Current Academic Year: 2020-21
Branch: Food Science and Technology	Semester: 6
1 Course Code	BFS-308
2 Course Title	Waste Management In Food Industries
3 Credits	4
4 Contact Hours (L-T-P)	4-0-0
Course Status	Compulsory

5	Course Objective	1. Understanding about food industry waste. 2. Importance and need of management the industrial waste. 3. Various treatment methods available for food waste. 4. Types, availability and utilization of by-products from waste. 5. Biomethanation and bio composting technology for organic waste utilization 6. Industrial waste treatments and ways for waste disposal method. 7.Food Additives; Food Adulteration	
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Comprehend the basic concept of waste and types. CO2: Waste Disposal method. Recognize the importance and utility of waste from food Industry CO3: Treatment of plant waste by physical, chemical and biological methods, Effluent treatment plants, Use of waste and waste water. Various hazards and their control measures. CO4: Types, availability and utilization of by-products of cereals, legumes & oilseeds, Utilization of by-products from food processing Industries. CO5: Status and utilization of dairy by-products. Industrial waste management CO6: Case study.	
7	Course Description	Food waste management is an application of utilization food waste. The types of treatment applied during processing identification are beneficial as by product recovery. In the future waste management could offer more depth knowledge with its applicable techniques. In this course, students will learn about the different treatments required in food manufacturing	
8	Outline syllabus		CO Mapping
	Unit 1	INTRODUCTION	CO1,
	A	Waste and its consequences in pollution and global warming.	CO1,
	B	Types of food processing wastes & their present disposal methods.	CO1, CO2
	C	Identification of waste.	CO1
	Unit 2	Treatment methods for liquid wastes	CO2, CO3
	A	Treatment of plant waste by physical, chemical and biological methods.	CO2
	B	Solid and liquid waste.	CO2
	C	Use of waste and waste water.	CO2
	Unit 3	Treatment methods of solid wastes	CO3
	A	Types, availability and utilization of by-products	CO3
	B	Vermin composting	CO3
	C	Utilization of by-products from sugar and agro based industries, and brewery & distillery waste.	CO3
	Unit 4	Bio filters and bio clarifiers	CO4

	A	Type of Filters used in Waste Water Treatment.	CO4
	B	Drinking Water treatment	CO4
	C	Recovery of useful materials from effluents by different methods.	CO4
	Unit 5	Case Studies	CO5,
	A	Sugar Cane Industry	CO5,CO6
	B	Meat Industry	CO5,CO6
	C	Milk Industry Case studies.	CO5,CO6
	Mode of examination	Theory	
	Weightage Distribution	CA 30%	MTE 20%
			ETE 50%
	Text book/s*	1) Beggs C. Energy Management and Conservation. Elsevier Publ. Chaturvedi P. 2000.	
	Other References	2) Energy Conservation through Waste Utilization. American Society of Mechanical Engineers, New York. Kreit F & Goswami DY. 2008. 3) Energy Management and Conservation Handbook. CRC Press. 4) Murphy WR & Mckay G. 1982. Energy Management. BS Publ. Patrick DR. 1982.	

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Research Methodology in Food Science: BFS311

School: SBSR	Batch : 2018-2021
Program: B.Sc.	Current Academic Year: 2020-21
Branch: Food Science and Technology	Semester: 6
1	Course Code BFS311
2	Course Title Research Methodology in Food Science

3	Credits	4
4	Contact Hours (L-T-P)	4-0-0
	Course Status	Compulsory
5	Course Objectives	1. To familiarize participants with basic of research and the research process. 2. To enable the participants in conducting research work and formulating research synopsis and report. 3. To impart knowledge for enabling students to develop data analytics skills and meaningful interpretation to the data sets so as to solve the Research problem.
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Familiarization of various research concepts in food Science CO2: Knowledge in formulating research design, hypothesis and selecting the research problem. CO3: Identify and discuss the concepts and procedure of sampling, data collection. CO4: Identify, explain compare and prepare the key element of a research proposal and report. CO5: Knowledge of data interpretation and data analysis. CO6: Demonstrate the knowledge of research process, research design and complete research hypothesis in research methodology.
7	Course Description	This course will provide an opportunity for participants to establish or advance their understanding of research through critical exploration of research language, ethics, and approaches. The course introduces the language of research, ethical principles and challenges, and the elements of the research process within quantitative, qualitative, and mixed methods approaches. Participants will use these theoretical underpinnings to begin to critically review literature relevant to their field or interests and determine how research findings are useful in forming their understanding of their work, social, local and global environment.
8	Outline syllabus	CO Mapping
	Unit 1	Type of Research
	A	Exploration, Description, Explanation, Scientific method and research
	B	Research Design-Experimental and observational, Quantitative and qualitative approaches
	C	Conceptualization and measurement, Variables, concept and measurement
	Unit 2	Sampling and Tools
	A	Role of sampling in research, Types of sampling
	B	Research Tools and Techniques, Validity and reliability
	C	Interviewing and observational methods
	Unit 3	Research Process
	A	Defining the problem, research questions, objectives, hypotheses, Review of related literature and originality in writing
	B	Planning the research, Subjects context and ethics,

		Methodology and tools			
	C	Citation formats: in medical science, social sciences.			CO3, CO6
	Unit 4	Sampling Process			CO4, CO6
	A	Exercise in sampling, Random Number Table, Exercise in designing tools and their analysis			CO4, CO6
	B	Interview and Questionnaire method			CO4, CO6
	C	Data collection Process: Conducting interviews, FGDs (focus on group discussion)			CO4, CO6
	Unit 5	Data Collection			CO5, CO6
	A	Levels of measurement			CO5, CO6
	B	Units of analysis, Case studies			CO5, CO6
	C	Result Interpretation			CO5, CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Kumar, R. (2005) Research Methodology: A Step by Step Guide for Beginners. Sage 2. Kothari C.R. (2008) Research Methodology: Methods and Techniques 2nd Ed New Age-International Pvt Tld, New Delhi.			
	Other References	1. Kerlinger F.N. and Lee, H.B. (2000) Foundations of Behavioural Research 4th Ed. Harcour College Publishers 2. Black J.A. & Champion, D.J. (1976) Methods and Issue in Social Research. New York Wiley and Sons.			

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Dairy Technology Lab: BFP305

School: SBSR		Batch : 2018-2021	
Program: B.Sc.		Current Academic Year: 2020-21	
Branch: Food Science and Technology		Semester: 6	
1	Course Code	Dairy Technology Lab	
2	Course Title	BFP 305	
3	Credits	2	
4	Contact Hours (L-T-P)	0-0-3	
	Course Status	Compulsory	
5	Course Objectives	The course is designed to equip students with a broad understanding of dairy chemistry and processing involved in manufacturing of dairy based products. The course provides a foundation for careers in new product development, dairy industry and quality control laboratories.	
6	Course Outcomes	After the successful completion of this course students will be able to: <ul style="list-style-type: none"> • CO1: Discuss milk and its nutritional value. • CO2: Evaluate an overview of the major macro and micronutrients relevant to human health available in milk. • CO3: Manufacturing and processing of various milk products • CO4: Analysis of milk safety and microbial spoilage • CO5: Application of Total Quality Management Systems into processes. • CO6: Understand processing conditions for different dairy products. 	
7	Course Description	Dairy Technology is a course which focuses on dairy products and is a part of the food technology and processing industry. Students pursuing dairy technology learn about milk processing as well the manufacturing process for its by-products. The study includes quality control at the time of processing of products. The course helps in gaining technical knowledge about dairy processing equipment	
8	Outline syllabus		CO Mapping
	Unit 1	Practical related to Plate-form Tests of milk	CO1, CO6
	A	Determination of COB, MBR Test	
	B	Determination of Alcohol Test, Sediment Test	
	C	Determination of SNF Content in Milk	
	Unit 2	Practical related to determination of nutrient constituents	CO2, CO6
	A	Determination of milk protein content	
	B	Determination of fat content in milk	
	C	Determination of Fat content in milk Products	
	Unit 3	Development of dairy products	CO3, CO6
	A	Development of Yogurt and cheese	
	B	Development of cheese	

	C	Development of Tofu	
	Unit 4	Practical related to determination of analysis of milk quality	CO4, CO6
	A	Determination of Titratable Acidity in Milk	
	B	Determination of Overrun in Ice-cream	
	C	Determination of fat content in milk	
	Unit 5	Detection of Adulterants	CO5, CO6
	A	Analysis of Adulteration in Milk and Milk products	
	B	Analysis of Adulteration in Milk and Milk products	
	C	Quality Testing of Butter oil / Ghee	
	Mode of examination		
	Weightage Distribution	CA 60%	MTE 0%
			ETE 40%
	Text book/s*	1. Ramesh C. Chandan: Dairy-based Ingredients, Eagan Press, 1997 2. Sukumar De: Outlines of Dairy Technology, Oxford University Press, 1980 3. Aneja, Mathur, Chandan & A.K. Bannerji: Technology of Indian Milk Products: Dairy India Publication	
	Other References		

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2

Technology of Animal Foods Lab: BFP308

School: SBSR		Batch : 2019-2022	
Program: B.Sc.		Current Academic Year: 2021-22	
Branch: Food Science and Technology		Semester: 6	
1	Course Code	Technology of Animal Foods Lab	
2	Course Title	BFP308	
3	Credits	2	
4	Contact Hours (L-T-P)	0-0-3	
	Course Status	Compulsory	
5	Course Objectives	This course shall educate students about the importance of meat and poultry industry in nation's economy. The students shall gain knowledge of the processing and preservation of meat, poultry and seafoods.	
6	Course Outcomes	After the successful completion of this course students will be able to: CO1: Identify the structure, quality and nutritional properties of egg. <ul style="list-style-type: none"> • CO2: Understand basic techniques to preserve meat and meat products. • CO3: Explain the importance of Crude fiber in daily life and how to analyse it from animal feed. • CO4: Understand how to prepare standard solution and able to explain normality and Molarity. • CO5: Able to analyse fat acidity from different animal source. • CO6: Understand the importance of saponification value to analyse the food quality. 	
7	Course Description	This course has been designed to make student understand the processing and preservation technology for meat, poultry and seafoods	
8	Outline syllabus		CO Mapping
	Unit 1	Analysis of nutritional/quality attributes of egg.	CO1
	A	Analysis of proximate constituents of egg.	
	B	Analysis of mineral content in egg shell	
	C	Evaluation of eggs for quality parameters	
	Unit 2	Formulation of Meat/Egg product formulation and their shelf life shelf-life	CO2
	A	Formulation of meat product	
	B	Formulation of egg product	
	C	Shelf life evaluation of any meat product	
	Unit 3	Analysis of fiber from animal feed	CO3
	A	Estimation of fiber in meat product-1	
	B	Estimation of crude fiber in meat product-2	
	C	Estimation of crude fiber in meat product-3	
	Unit 4	Solution preparation/dilution preparation	CO4
	A	Preparation of dilutions	

	B	Preparation of molar solutions			
	C	Preparation of normal solutions			
	Unit 5	Analysis of analysis of fat acidity/saponification value			CO5, CO6
	A	Analysis of fat acidity in given sample			
	B	Analysis of saponification value in given sample-1			
	C	Analysis of saponification value in given sample-2			
	Mode of examination				
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	1) Lawrie R A, Lawrie's Meat Science, 5th Ed, Woodhead Publisher, England, 1998 2) Parkhurst & Mountney, Poultry Meat and Egg Production, CBS Publication, New Delhi, 1997 3) Pearson & Gillet Processed Meats, 3 Ed, CBS Publication, New Delhi, 1997			
	Other References				

Course Articulation Matrix

CO/ PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2
CO6	3	2	2	2	2